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A QUARTERLY FOR THE DENTAL TEACHER

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By William T. Salter, M.D., Professor of Pharmacology, Yale University School of Medicine. About 1200 pages, 7" x 10", with 294 illustrations. *New.*

W. B. SAUNDERS COMPANY

West Washington Square — Philadelphia 5

THE JOURNAL OF DENTAL EDUCATION

A QUARTERLY FOR THE DENTAL TEACHER

VOLUME 16 JANUARY, 1952 NUMBER 1

"An ignorant man has been defined as one whom God has packed up and men have not unfolded."
NEWELL DWIGHT HILLIS

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Published by the American Association of Dental Schools

The JOURNAL presents the proceedings of the American Association of Dental Schools and such additional papers and comment from responsible sources as may be useful for the promotion of oral health service and the advancement of the dental profession. The JOURNAL disclaims responsibility, however, for opinions expressed by authors.

Offices of the Editor and Managing Editor: University of California, College of Dentistry, The Medical Center, San Francisco 22, California. *Subscription rates:* Domestic—$2.00 per year. Published four times a year—January, March, May and November. Entered as second class matter at the Post Office at San Francisco, California, under the act of August 24, 1912. Copyright, 1950, by the American Association of Dental Schools. *Printed by* The Recorder Press, San Francisco, California.

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"The rung of a ladder was never meant to rest upon, but only to hold a man's foot long enough to enable him to put the other somewhat higher."

THOMAS HUXLEY.

EDITORIAL

Second Western Conference on Dental Teaching

The first week in September witnessed the Second Western Conference on Dental Education. Ninety-six dental teachers from the five dental schools on the Pacific Coast, plus a few visitors from the Medical and Public Health Schools of the University of California, gathered at the College of Dentistry, University of California, for the purpose of considering the use of audio-visual aids in the teaching of dentistry. This meeting, like the one held the previous year at the University of Oregon Dental School, was unique in that its attention was centered and limited to specific methods of pedagogic technique. It is safe to say that if equivalent time to that which is spent in developing the subject matter taught in Dental courses were devoted to the manner and methods of teaching, the dental curriculum could be reduced one fourth or its content increased proportionally.

The reason for selection of the field of audio-visual aids is ably stated by Dean Willard C. Fleming in the preface to the program of the conference:

"The field of Audio-Visual Aids suggested itself for several reasons, three of which are worthy of underlining. *Reason One:* The crowded state of the dental curriculum suggests we must either lengthen our total teaching time, or develop more efficient methods of teaching. The use of teaching aids is a step in the latter direction. *Reason Two:* The increase in use of audio-visual aids in secondary and pre-professional education has prepared the dental student to expect their continued employment in the professional schools, particularly in dentistry and medicine which abound in opportunities for their use. *Reason Three:* The availability of the Twelfth Naval District Training Aid Center in San Francisco and the splendid spirit of enthusiasm and cooperation of the personnel of that center."

The conference was keynoted by Mr. James W. McCauley, Educational Advisor to the Director of Training, Twelfth Naval District, who made a splendid statement of principles that must be given consideration in the planning of any educational program, be it a curriculum, course, or demonstration. These doctrines apply to the use of visual aids as well as to all other educational technics. Their use was ably demonstrated by Mr. C. A. Welch, Director of the Naval Training Aid Center on Treasure Island. The ingenuity exercised in fabricating training aids from materials which are available to all is a challenge to the resourcefulness of the dental teacher.

The morning of the second day provided an excellent and entertaining demonstration of the application of television to dental teaching. This new and intriguing medium was subjected to all manner of test as a means of portraying dental clinical procedures and technical operations. It was, perhaps, the first time that television technicians and dental teachers combined their talents in a premeditated test of the potentiality of this medium. The conference was particularly indebted to Drs. Harold Ray and Wendell Wylie for the planning and execution of this part of the program.

On Thursday afternoon representatives from all of the participating schools presented certain teaching aids they considered particularly useful. This session was interesting, not only because of exposition of new technics but also the demonstration of unique application of old or better known devices.

It has been a determined policy of this as well as the former conference to keep the programs upon a practical basis. In conformity with this idea the morning of the third and last day Mr. Gardner Hart, Director of Audio-Visual Education, Oakland Public Schools, and Dr. William E. Stiles, Associate Professor of Public Health, University of California, collaborated in the demonstration of many principles which had been elaborated earlier by Mr. McCauley. The conference was summarized in the afternoon and opportunity afforded for some additional discussion by participating teachers. At this time there was a general and genuine expression of benefit derived from this meeting and the value of this type of conference. The University of Washington offered to play host to a similar meeting in September of 1952.

The Western Conference on Dental Teaching is an expression of the need felt by many dental teachers for a greater utilization of the methods and technics of modern pedagogy to their own problems. In these days when the dental student has witnessed good teaching methods in his predental training he often finds in his dental course that his time is wasted and his interest dulled by archaic and ineffective teaching methods. We have enlisted the basic sciences in the development of the dental procedures and technics, yet we have neglected the science and technics of pedagogy in designing effective presentation of our subject matter to the student and our evaluation of him. Our teachers who are advancing the standards of dentistry are no longer amateurs in the field of dental practice. Neither can they be amateurs in the field of education. To further effective teaching is the reason the Western Conference on Dental Teaching came into existence.

HAROLD J. NOYES

CLINICAL ACHIEVEMENT

STUDENT AVERAGE QUANTITATIVE CLINICAL ACHIEVEMENT

Report of a Survey[1]

CHARLES W. CRAIG, D.D.S.[2]

In presenting this paper on "Student Average Quantitative Clinical Achievement," it should be emphasized that it is neither the intent of the author, nor the purpose of the paper, to point out how little or how much our students should accomplish in clinical dentistry prior to graduation. It is presented, and makes available for the first time the average amount of clinical experience our graduating students are obtaining prior to assuming the responsibilities of a dental practice.

The essayist would likewise emphasize that qualitative proficiency is of paramount importance, not to be overshadowed by any achievement measured solely in terms of quantity. It is not within the scope of this presentation to discuss the qualitative requirements of our several schools or the qualitative progress and achievement of our students. We will agree that all schools of dentistry are graduating students primarily on the basis of quality rather than quantity and that the exceptional student may demonstrate his qualitative ability with correspondingly less clinical experience than the average or below average student. Assuming that we are in agreement, may we not, therefore, assume that this report on average quantitative achievement embraces qualitative proficiency as well?

It was contemplated that as in the past, representatives of our several schools and of the several clinical divisions within the schools would be in attendance at the Conference Session on Clinic Administration. It therefore seemed necessary that the student average clinical achievement should not be limited to any one school or any one division within a school, but should embrace all schools and their several clinical divisions and sections.

The information herewith presented and the accompanying tables were obtained and compiled from 36 out of a possible 45 questionnaires returned from dental schools of the United States and Canada, 32 from the former and four from the latter. Unfortunately, two returned questionnaires arrived too late for inclusion in the tabulations.

Listening to a detailed tabulation of all available statistical data ob-

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[1]Presented before the Section on Clinic Administration, American Association of Dental Schools Meeting, French Lick Springs, Indiana, March 20, 1951.

[2]Professor of Operative Dentistry and Director of Clinics, University of California, College of Dentistry.

tained from an analysis of returned questionnaires would only contribute to confusion, and in all probability would prove most wearisome. Therefore, the highlights and an overall portrayal of the findings and pertinent observations are recorded.

A series of tables containing the apposite data in detail is incorporated within the paper from which individuals may pursue a further and more comprehensive study. In general this report covers the high, low and average figures as compiled from information furnished by the several schools. The standard deviation is not reported, but can be worked out from the tables by those interested. The omission of a school from a table, or spaces within a table not filled in, indicates either that the information was not furnished or was not reported in a manner applicable to the method of tabulating the survey.

Realizing that in some schools pedodontia is incorporated within the division of operative dentistry, whereas in others it is administered as a separate division, individual tables (1a and 1b) have been prepared. The last column in Table 1b embraces a grand total of both operative and pedodontia. Such an arrangement should be in accordance with the method of clinical administration employed by the several schools, with respect to these two clinical activities. A similar separation of tables likewise holds true for mouth hygiene (Table 1c), periodontia (Table 1c) and endodontia (Table 1d).

Operative Dentistry

On the basis of 33 schools reporting on operative dentistry (Table 1a), exclusive of pedodontia, and 21 on the number of hours devoted to clinical instruction in this activity (Table 2), a student will average 120.22 restorations, with an overall average of 447 hours of his clinical time devoted to operative dentistry. There was a high of 246 and a low of 65 reported as the average number of restorations placed, with a maximum of 672 hours and a minimum of 225 hours, the latter embracing ceramics. Surprisingly, the institution recording the greatest number of hours did not reveal the greatest number of restorations, neither did the one revealing the least number of hours report the lowest in restorations.

The author noted, with some surprise, that there were but four colleges reporting clinical restorative operative procedures during the sophomore year, three reporting the average number of restorations placed and one mentioning the fact only. A report[8] presented before the Operative

[8]Craig, Charles W.: Some Phases of Clinical Operative Dentistry under the Accelerated Program, presented before the Section on Operative Dentistry, American Association of Dental Schools' Meeting, Chicago, March 21, 1944.

AVERAGE CLINICAL QUANTITATIVE ACHIEVEMENT PER STUDENT IN DENTAL SCHOOLS OF THE UNITED STATES AND CANADA

Schools	OPERATIVE DENTISTRY (Excluding Pedodontia)																						
	Gold Foils				Gold Inlays				Amalgams				Silicates and Self Curing Acrylics				Cements			Class Totals			Grand Total
	Soph.	Jr.	Sr.	Total	Soph.	Jr.	Sr.	Total	Soph.	Jr.	Sr.	Total	Soph.	Jr.	Sr.	Total	Jr.	Sr.	Total	Soph.	Jr.	Sr.	
YK		8	22	30		5	20	25		10	15	25		4	12	16					27	69	96
OK		4.90	15.80	20.70		6	16.60	22.60		29.80	53.30	83.10		10.20	20.30	30.50	22.50	34.20	56.70		73.40	140.20	213.60
KL		3	5	8		9	18	27		24	5	29		7	4	11	11	8	19		54	40	94
TK		8	6	14		4	8	12		20	68	88		8	10	18	12	8	20		52	100	152
KC				15				15				60				20							110
KE		10	20	30		16	20	36		35	40	75		20	30	50					81	110	191
AK		2	8	10		5	26	31		11	28	39		4	13	17					22	75	97
KG		3	3	6		4	4	8	4	30	30	64	2	8	8	18				6	45	45	96
VK		8.10	7.70	15.80		14.10	13.90	28		25	15.20	40.20		.20	2.10	2.30					47.40	38.90	86.30
KI		4	8	12		5	16	21		9	13	22		3	8	11	3	7	10		24	52	76
XK		6	15	21		6	18	24		12	36	48		6	10	16					30	79	109
RA		8	23	31		6	17	23		30	50	80		8	12	20	4	4	8		56	106	162
FR		8	16	24		5	8	13		52	43	95		8	8	16	.65	.30	.95		73.65	75.30	148.95
RN		10	27	37		10	15	25		35	17	52		7	7	14	2	1	3		64	67	131
GP		2	7	9		2	10	12		21	15	36		14	10	24					39	42	81
PE		1	7	8		1	6	7		87	102	189		14	19	33	5	4	9		108	138	246
XP		3	8	11		3	10	13		15	40	55		10	25	35					31	83	114
PO		6	12	18		8	15	23		17	35	52		2	6	8					33	68	101
SV			10	10		8	16	24		20	25	45		5	5	10					33	56	89
WS		5	12	17		7	12	19		10	16	26		6	10	16					28	50	78
SS	Operative and pedodontia combined. Listed only in grand total of operative and pedodontia—Table 1b																						
SG		4	17	21		6	14	20		30	35	65		9	15	24					49	81	130
JS		8	17	25		6	12	18		15	35	50			10	10					29	74	103
SQ	1	8	8	17	2	12	11	25	2	19	17	38		4	4	8	6	6	12	5	49	46	100
AS		5	16	21		8	15	23		25	20	45		4	6	10	Incl. with sil.				42	57	99
SM		10	17	27		10	20	30		15	25	40		10	15	25	5	5	10		50	82	132
ZS		7.50	13.40	20.90		13.10	12.40	25.50		18.80	20	38.80		7.30	9.80	17.10					46.70	55.60	102.30
SO		6.20	9.70	15.90		11.40	15.80	27.20		43.40	20.10	63.50		13.50	12.70	26.20	3.50	1.10	4.60		78	59.40	137.40
DS	.04	1.85	12.63	14.52	.18	5.88	19.30	25.36	1.20	17.41	27.48	46.09	.24	4.44	6.60	11.28				1.66	29.58	66.01	97.25
NH		6	13	19		20	18	38		28	18	46		16	21	37	20	28	48		90	98	188
HU		5	8	13		8	13	21		11	15	26		2	3	5					26	39	65
FH		4.90	8.20	13.10		4.10	11.40	15.50		38.20	25.30	63.50		9.70	8.70	18.40	.90	2.20	3.10		57.80	55.80	113.60
HZ		7	9	16		14	10	24		37	21	58		8	5	13					66	45	111
QH		8	12	20		10	14	24		27	24	51		9	13	22					54	63	117
HB	Operative and pedodontia combined. Listed only in grand total of operative and pedodontia—Table 1b																						
Total	1.04	181.45	393.43	590.92	2.18	252.58	455.40	725.16	7.20	817.61	949.38	1834.19	2.24	241.34	349.20	612.78	95.55	108.80	204.35	12.66	1588.53	2256.21	3967.40
Average	.52	5.85	12.29	17.91	1.09	7.89	14.23	21.97	2.40	25.55	29.67	55.58	1.12	7.79	10.91	18.57	7.35	8.37	15.72	4.22	49.64	70.51	120.22

TABLE 1a

AVERAGE CLINICAL QUANTITATIVE ACHIEVEMENT PER STUDENT IN DENTAL SCHOOLS OF THE UNITED STATES AND CANADA

Schools	PEDODONTIA																			
	Inlays (Ag. or Au.)			Amalgams			Silicates & Cements			Pulp Therapy–No. of Teeth			Space Maintainers			Class Totals*		Grand Total*	Grand Total Operative & Pedodontia
	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.		
YK				5	15	20					1	1		1	1	5	17	22	118
OK	.10	.51	.61	16	18.50	34.50	9.90	10.60	20.50							26	29.61	55.61	269.21
KL		4.50	4.50		12	12		1.50	1.50		1.70	1.70		1.50	1.50		21.20	21.20	115.20
TK	3	5	8	60	35	95	8	7	15		3	3		1	1	71	51	122	274
KC				9	30	39	1	5	6	2	5	7		1	1	12	41	53	163
KE				44	44	88	4	4	8	15	15	30		1	1	63	64	127	318
KG				2	16	18					1	1	1		1	3	17	20	116
VK		1	1	5	15	20	1	4	5	1	3	4		1	1	7	24	31	117.30
KI		1.50	1.50		25	25		.50	.50		1.50	1.50		1	1		a31.50	a31.50	a107.50
XK				5	15	20		5	5		2	2		2	2	5	24	29	138
RA		1	1	15	25	40	4	4	8	1	2	3		1	1	20	33	53	215
FR					27	27		5	5		4	4		1.50	1.50		37.50	37.50	186.45
RN				10	5	15	1		1	1		1	.18	.32	.50	12.18	5.32	17.50	148.50
GP		2	2		10	10		10	10		5	5		1	1		28	28	109
PE				30	35	65	7	9	16					1	1	37	45	82	328
XP					25	25		10	10					1	1		36	36	150
PO					60	60					2	2		4	4		66	66	167
SV					7.09	7.09		1.05	1.05		.21	.21		.12	.12		8.47	8.47	97.47
WS										1	1	2	1	1	2				
SS	Pedodontia and operative combined. Listed only in grand total of operative and pedodontia.																		229
SG		1	1	8	30	38	2	5	7	1	4	5		2	2	11	42	53	183
JS	2		2	20	5	25	4		4	2		. 2	1		1	29	5	34	137
SQ				12	15	27					1	1		1	1	12	17	29	129
SM		1	1	12	18	30				1	1	2		1	1	13	21	34	166
ZS																			
SO				18	35	53	1	3	4		1	1		1	1	19	40	59	196.40
DS		2	2	4	20	24	4	5	9		3	3		2	2	8	32	40	137.25
NH				11	7	18	6	8	14	.50	.50	1	.50	.50	1	18	16	34	222
HU				1	2	3	1	3	4	1	2	3				3	7	10	75
FH	.05	.03	.08	24.50	15.50	40	4.50	5.30	9.80	2.10	2.30	4.40	2	2	4	33.15	25.13	58.28	171.88
HZ				6	12	18				1	2	3		1	1	7	15	22	133
QH		2	2	10	25	35	10	20	30		2	2		1	1	20	50	70	187
HB	Pedodontia and operative combined. Listed only in grand total of operative and pedodontia.																		154.50
Total	5.15	21.54	26.69	327.50	604.09	931.59	68.40	125.95	194.35	29.60	66.21	95.81	5.68	31.94	37.62	434.33	849.73	1284.06	5258.66
Average	1.29	1.80	2.05	14.89	20.83	32.12	4.27	6	8.45	2.28	2.65	3.55	.95	1.23	1.34	19.78	29.30	44.28	169.63

*—Each pulp therapy and space maintainer counted as a restoration in totals.

TABLE 1b

a—Seniors average 2 gold foils in pedodontia and included in the total.

Conference of this association in 1944 accounted for 16 schools introducing their students to clinical restorative procedures during the sophomore year.

It is worthy of note that only one school revealed all gold foil operations restricted to the senior year, while two reported foils being placed clinically by sophomores. In another school silicate and self curing acrylics are apparently restricted to the senior class. A few voluntarily commented that self curing acrylic resins were used only occasionally.

Pedodontia

Twenty-nine schools reported on pedodontia (Table 1b) with an overall average of 44.28 restorations per student, with a high of 127 and a low of 8.47. It should be stated that, for convenience in tabulating and reporting, each pulp therapy and each space maintainer has been counted as a restoration in the grand total column of student average accomplishment. Fifteen schools averaged 3.3 dietary surveys per student in the division of pedodontics.

The greatest number of hours may be revealed as 245 with three institutions entering a low figure of 40, the overall average as compiled from the reports of 21 schools being 116 hours.

It is worthy of note that seven colleges listed seniors only in the practice of pedodontics, while none reported it exclusively during the junior year. However, there were some classifications, namely, inlays, silicates, pulp therapy and space maintainers, where there was slight evidence of such practice only by the junior student. Of the reports on pedodontics only five schools reported the junior accomplishment greater than that of the senior.

Less than one half of the schools accounted for the placement of inlays in clinical pedodontia with an average of but 2.05 per student. This leads to the assumption that they are not too frequently placed in the majority of our school clinics, though one school did record an average placement of eight inlays per student in pedodontia.

One school revealed an average of two gold foil restorations per senior student in their pedodontic clinic.

A recapitulation of operative and pedodontia when combined accounts for an overall average of 169.63 restorations, the high being 328 and the low 75.

Mouth Hygiene

Turning to Table 1c we observe an overall average of 53.43 hours of mouth hygiene per student, with a maximum of 175 hours and a minimum of 3.5 hours reported.

AVERAGE CLINICAL QUANTITATIVE ACHIEVEMENT PER STUDENT IN DENTAL SCHOOLS OF THE UNITED STATES AND CANADA

Schools	MOUTH HYGIENE Expressed in Hours					PERIODONTIA Expressed in Hours				Hours Hyg. & Perio.	DIET SURVEYS (Number of Surveys) Pedodontic			Periodontic			Miscellaneous			Total (Class)		Grand Total
	Fresh.	Soph.	Jr.	Sr.	Total	Soph.	Jr.	Sr.	Total		Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.	
YK			50	20	70			42	42	112												
OK			15.20	14.80	30		24	48	72	102												
KL							75	100	175			5	5	6	5	11				6	10	16
TK			10	15	25			6	6	31												
KC			15	25	40		15	50	65	105												
KE										112				4	2	6				4	2	6
KG							30	40	70													
VK			20.80	12.80	33.60			80	80	113.60												
KI			35	25	60		10	85	95	155		4	4				1	6	7	1	10	11
XK			15	8	23		15	30	45	68		1	1	2	2	4				2	3	5
RA	a	a									1	2	3				1	2	3	2	4	6
FR		25	75	50	150		42	5	47	197					1	1					1	1
RN	10	47	5	3	65		27	36	63	128	1	1	2	1	1	2				2	2	4
ŽR		5			5		75	75	150	155												
GP														8	15	23				8	15	23
PE			15	15	30		6	9	15	45		1	1								1	1
XP			25	35	60		20	50	70	130		5	5		1	1	3	1	4	3	7	10
PO		8	10		18	7	20	120	147	165				1	3	4				1	3	4
WS			50	35	85		20	20	40	125	2	3	5							2	3	5
SS			11	22	33		22	33	55	88	5	8	13	2	4	6				7	12	19
SG						3	40	48	91		1	1	2	3	3	6				4	4	8
JS		b																				
SQ										36												
AS			30	30	60		20	20	40	100	1	1	2	1	1	2				2	2	4
SM										150												
SO			3	.50	3.50		60	30	90	93.50		3	3	2	3	5				2	6	8
DS		50	5.04	1.15	56.19		30.07	12.50	42.57	98.76												
NH			75	100	175		15	35	50	225												
HU		5	10	15	30	1	5	10	16	46												
FH			30	18	48			60	60	108		.50	.50								.50	.50
HZ		8	25	25	58		15	35	50	108							2	2	4	2	2	4
QH			30	20	50		12	18	30	80		2	2		2	2					4	4
HB	4		40	30	74		20	20	40	114		1	1	1		1				1	1	2
Total	14	148	600.04	520.25	1282.39	11	618.07	1117.50	1746.57	2990.86	11	38.50	49.50	31	43	74	7	11	18	49	92.50	141.50
Average	7	21.14	26.09	23.65	53.43	3.67	26.87	41.39	64.69	110.77	1.83	2.56	3.30	2.82	3.31	5.28	1.75	2.75	4.50	3.06	4.62	7.07

a—Freshmen and sophomores in for mouth hygiene. Hours not reported.

TABLE 1c

b—Sophomores in for mouth hygiene. Hours not reported.

Three schools accounted for freshmen participating in clinical mouth hygiene, two reporting in hours which averaged seven per freshman, and one reporting such an activity, but omitting the time. Nine schools recited this clinical activity for sophomores, seven revealing the hours, which averaged 21.14 and two noting the practice with no mention of time.

The total experience in mouth hygiene prior to the junior year is analyzed as being confined to ten schools which again does not coincide with the report[8] previously referred to in relation to the introduction of students to clinical procedures. At that time (1944) 15 schools related clinical mouth hygiene as a transitional procedure.

Periodontia

Periodontia (Table 1c) is reported by 27 schools with an overall average of 64.69 hours per student. One school reported the high of 175 hours, but made no report on mouth hygiene. One might suspect the inclusion of the latter, but it has been recorded as reported. The low recorded was six hours. A statement relative to the minimum requirements of this school listed the periodontic requirement as one case. This might conceivably average six hours.

Four schools apparently undertake periodontic treatment only during the senior year, while in three schools students receive their first clinical periodontic instruction during the sophomore year, the average for the latter being but 3.67 hours.

Dietary surveys as disclosed by 14 schools averaged 5.28 in the periodontic clinic with a high of 23 and a low of one reported. The school reporting the high did not report on surveys under the miscellaneous classification and none in the pedodontic clinic. It is conceivable this figure might embrace at least two, if not all three, categories.

Compiled from the reports of 27 schools, the overall average per student for time devoted to clinical mouth hygiene and periodontia combined may be revealed as 110.77 hours, with a high of 225 and a low of 31 hours.

Dietary Surveys

Dietary surveys (Table 1c) have been previously enumerated under pedodontia and periodontia, leaving only the miscellaneous classification for surveys not applicable to the aforementioned divisions. Only four schools reported on this classification with an average of 4.5 surveys per student.

The overall average of 20 schools reporting on all dietary surveys—

pedodontic, periodontic and miscellaneous may be stated as 7.07 per student. Four schools only reported dietary surveys exclusively during the senior year.

Endodontia

Accepting the returns of 32 schools with respect to clinical endodontia (Table 1d), it is interesting to note that only 14 or 43.75 per cent of these schools permit their students to treat molar teeth, such treatment being restricted to senior students in six schools only, while in the others, the practice is shared with the juniors. In those schools reporting on the treatment of molars, the overall average is 2.32 molars per student.

Seventeen schools apparently limit their clinical instruction in endodontia to teeth anterior to the molars, their overall average per student being 3.87 anteriors or bicuspids. Here again six schools accounted for the treatment of such teeth only during the senior year.

Considering the reports from an overall aspect, with regard to the treatment of both molars and those teeth anterior thereto, it was observed that a student will average in treatment 5.06 teeth, the greater percentage of which are treated during the senior year. There was a high of 15 and a low of one tooth reported, the high accounting for six teeth being treated during the junior year and nine during the senior year. Only one school accounted for clinical endodontia being restricted to the juniors, in which school a student will treat an average of two anteriors or bicuspids.

A report on endodontia would not be complete without some reference to the time necessary to accomplish treatment. It would have been enlightening to have had a comparison of the treatment time for molars and other teeth, but with simplicity in mind, the questionnaire was limited only to an overall consideration of the time element.

However, since 13 of the schools reporting on time appear to limit their clinical endodontic instruction to anteriors and bicuspids, it was not difficult to determine their average as 7.82 hours per tooth.

On the other hand, ten schools incorporating the treatment of molars, in addition to teeth more anteriorly positioned, and from which reports on time were available, surprisingly averaged but 7.84 hours per tooth. This is a very small differential which may be explained, in part at least, to the fact that in these schools the teeth treated are preponderantly anterior to the molars.

Considering the overall average which was calculated from 23 schools reporting on time, it was noted that a student will average 34.82 hours in treating all teeth or 7.83 hours in treating each individual tooth.

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Schools	ENDODONTIA															ORAL SURGERY		
	Ant. & Bi. (No. of Teeth Treated)			Molar (No. of Teeth Treated)			Total No. Teeth Treated per Student by Class		Total No. Teeth Treated per Student	Average Hours per Student by Class—All Teeth Treated		Total Average Hours per Student All Teeth	Average Hours per Student per Tooth		Overall Average Hours per Tooth	No. of Teeth Extracted		
	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.		Jr.	Sr.		Jr.	Sr.		Jr.	Sr.	Total
YK	1	3	4				1	3	4	10	24	34	10	8	8.50	20	40	60
OK	3	5	8		1	1	3	6	9	30	48	78	10	8	8.66		160	160
KL		5.30	5.30		2.10	2.10		7.40	7.40		75	75		10.14	10.14	32	49	81
TK		2	2					2	2		12	12		6	6		50	50
KC		5	5					5	5		25	25		5	5		50	50
KE		6	6					6	6		56	56		9.34	9.34		150	150
AK	1	2	3				1	2	3	7	12	19	7	6	6.34		55	55
KG			2.70			.30			3							10	72	82
VK	1	2	3	1	1	2	2	3	5							15	60	75
KI	1	4	5		2	2	1	6	7	4	24	28	4	4	4		22	22
XK	1	3	4	1	1	2	2	4	6	10	20	30	5	5	5	15	85	100
RA	1	1	2				1	1	2							80	80	160
FR	.70	.90	1.60	2	1.90	3.90	2.70	2.80	5.50	10.80	14	24.80	4	5	4.51		126	126
RN	.96	1.04	2	.10	.54	.64	1.06	1.58	2.64	11.68	15.14	26.82	11.02	9.59	10.16		43	43
GP	1	2	3				1	2	3	12	16	28	12	8	9.34	5	25	30
PE	2	3	5				2	3	5	6	9	15	3	3	3	38	48	86
XP	1	2	3				1	2	3	8	16	24	8	8	8	20	100	120
PO		2	2					2	2		30	30		15	15		40	40
SV																30	120	150
WS	2		2				2		2	20		20	10		10		40	40
SS	2	5	7	4	4	8	6	9	15							70	100	170
SG	3	3	6		1	1	3	4	7	12	16	28	4	4	4	50	200	250
JS	1	1	2				1	1	2								40	40
SQ																	100	100
AS	2	2	4				2	2	4								40	40
SM	1	1	2				1	1	2	7	7	14	7	7	7	25	60	85
ZS							3	6.60	9.60									73
SO																	64	64
DS	3.97	3.45	7.42	1.68	.83	2.51	5.65	4.28	9.93	65	37.35	102.35	11.51	8.73	10.31		55	55
NH	3	4	7	1	2	3	4	6	10	20	30	50	5	5	5	32	70	102
HU	2	4	6				2	4	6									
FH	3	2	5				3	2	5	12	9	21	4	4.50	4.20	25	150	175
HZ	1		1		2	2	1	2	3	15	35	50	15	17.50	16.67	26	40	66
QH	2	1	3		2	2	2	3	5							15	60	75
HB		1	1					1	1		10	10		10	10	80	245	325
Total	40.63	76.69	120.02	10.78	21.37	32.45	54.41	104.66	162.07	260.48	540.49	800.97	130.53	166.80	180.17	588	2639	3300
Average	1.69	2.74	3.87	1.54	1.64	2.32	2.18	3.49	5.06	15.32	24.57	34.82	7.68	7.58	7.83	32.66	79.97	97.06

TABLE 1d

Oral Surgery

Here again, for the purpose of simplicity, that portion of the questionnaire pertaining to oral surgery (Table 1d) limited the inquiry only to the number of teeth extracted, making no differentiation between the removal of impacted or imbedded teeth and the so-called "simple" extractions. The author is not unmindful of the importance of clinical experience, either through observation and assistance or by actual experience, in apiectomies, removal of cysts, biopsies, fractures, etc., but such detail was not within the scope of this survey.

A scrutiny of the tabulations discloses that of the 33 schools reporting by classes on this clinical activity, the juniors participate in the removal of teeth in 18 schools, with an average of 32.66 teeth extracted per junior. A senior student will, in 33 schools, average 79.97 extractions.

In 15 schools extractions are restricted to the senior class only.

A general average for 34 schools was found to be 97.06 extractions per student, with a high of 325 and a low of 22 teeth per student.

The average time devoted to clinical instruction in oral surgery, based on reports of 21 schools, was found to be 98 hours, the high being 252 and two schools reporting a low of 30 hours each.

Ceramics

Thirty-four schools advised of their clinical activities in ceramics (Table 1e), through which information the impression was made that only a small percentage (17.14%) of the schools require the construction and placement of porcelain, or for that matter acrylic, inlays. The general average, for the six schools reporting their use, was found to be 1.11 inlays per student, with a high of 2 and a low of 0.62.

Based on returns received, it may be stated that of the 35 reporting on ceramics, 34 employ the porcelain jacket or acrylic crown. It is worthy of note that at least one fourth of the replies revealed that acrylic restorations were either seldom or not in use at all. However, one school reported their students would each average 0.34 acrylic crowns, which apparently constituted their sole clinical experience in ceramics.

Sixteen schools reported on clinical ceramics as being taught only in the senior clinic, while but two advised of such instruction being limited to the juniors.

A general average in crowns (porcelain and acrylic) has been tabulated as 2.09 for each student.

The hours devoted to clinical ceramics were buried with those of other divisions, primarily crown and bridge, in at least ten of the schools.

AVERAGE CLINICAL QUANTITATIVE ACHIEVEMENT PER STUDENT IN DENTAL SCHOOLS OF THE UNITED STATES AND CANADA

Schools	CERAMICS						CROWN AND BRIDGE																				
	Crowns Porc. or Acrylic			Inlays Porc. or Acrylic			Full Veneer Crowns			Partial Veneer Crowns			Dowel Crowns			Overall Average For all Crowns			Anterior Bridges			Posterior Bridges			Overall Average for all Bridges		
	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.	Total	Jr.	Sr.	Total
YK		1	1																								
OK		1	1					2	2		3	3		2	2		7	7		1	1		2	2		3	3
KL	1	3	4													1.30	.90	2.20	.50	.40	.90	1.60	1.50	3.10	2.10	1.90	4
TK		1	1		1	1		1	1		1	1		1	1		3	3									1
KC		3	3					3	3		5	5		1	1		9	9		1	1		2	2		3	3
KE	2	6	8				2	4	6		1	1		1	1	2	6	8	1	2	3	1	3	4	2	5	7
AK		1	1																								
KC				2		2		2	2		3	3		1	1		6	6		.50	.50		3	3		3.50	3.50
VK	.06	.60	.66				.01	1.10	1.11	.02	2.30	2.32	.08	.10	.18	.11	3.50	3.61	.01	.50	.51	.10	2.40	2.50	.11	2.90	3.01
KI		1.50	1.50				1		1				1	1	2	2	1	3	1	a		1	a		2	3	5
XK	.34		.34					2	2		2	2		.25	.25		4.25	4.25		1	1		3	3		4	4
RA	1	1	2				1	1	2	1	2	3				2	3	5		1	1	1	1	2	1	2	3
FR	.81	3	3.81				.92	3.70	4.62	1	3.60	4.60				1.92	7.30	9.22	.36	3	3.36	.04	2	2.04	.40	5	5.40
RN	.12	1.40	1.52	.02	.60	.62	.52	1.50	2.02	.18	.47	.65	.04	.28	.32	.74	2.25	2.99	.04	.54	.58	1.20	1.20	2.40	1.24	1.74	2.98
GP	2	6	8		2	2	1	4	5	1	6	7		2	2	2	12	14	1	2	3	1	3	4	2	5	7
PE		1	1					1	1	2	4	6	1	1	2	3	6	9		1	1		1	1		2	2
XP	b	2	2	b	1	1												1	1	1	2		1	1	1	2	3
PO		1	1					2	2	1	3	4				1	5	6		1	1		2	2		3	3
SV		2	2													3	6	9							1	3	4
WS		1	1					1	1		1	1					2	2		1	1	1	2	3	1	3	4
SS		2	2																1	1	2	1	2	3	2	3	5
SG		1	1					3			3				.50			6.50			1			3			4
JS	1	1	2													1	4	5									
SQ		1	1					1	1	1	1	2				1	2	3		1	1	2	1	3	2	2	4
AS	1	1	2				2	4	6	2	2	4				4	6	10	1	2	3	2	2	4	3	4	7
SM		1	1				1	2	3							1	2	3	1	2	3		2	2	1	4	5
ZS	.30	.70	1													1	2.40	3.40							.80	2.80	3.60
SO		1	1				1.15	2.20	3.35		.82	.82				1.15	3.02	4.17									
DS	1	2.20	3.20				2	3.30	5.30				.50	.50	1	2.50	3.80	6.30		3	3	3	6	9	3	9	12
NH	.05	1	1.05	.05	1	1.05	5.50	4	9.50	.10	.10	.20	.01	.10	.11	5.61	4.20	9.81	.60	1.30	1.90	1	1.80	2.80	1.60	3.10	4.70
HU	1	2	3																1	2	3		1	1	1	3	4
FH			2																								
HZ	1	2	3				2	3	5							2	3	5							1	3	4
QH		2	2					1	1		1	1					2	2		1	1		1	1		2	2
HB	1	1	2				1	3	4	1	2	3				2	5	7							1	2	3
Total	13.68	55.40	71.08	2.07	5.60	7.67	21.10	52.80	76.90	10.30	44.29	57.59	2.63	11.23	14.36	40.33	121.62	169.45	9.51	30.24	39.75	16.94	46.90	65.84	30.25	90.94	126.19
Average	.85	1.73	2.09	.69	1.12	1.11	1.51	2.30	3.07	.94	2.21	2.74	.44	.86	1.03	1.92	4.34	5.65	.73	1.31	1.66	1.21	2.04	2.74	1.44	3.24	4.21

a—3 bridges in senior year not segregated by type.

TABLE 1e

b—Either a porcelain crown or inlay in junior year.

However, of the 11 reporting them separately, we find an overall average of 23 hours devoted to this particular clinical subject for each student.

Crown and Bridge

For convenience in breakdown, crown and bridge prosthesis is presented sectionally, discussing first that activity which pertains to cast crowns alone, and lastly bridgework.

In tabulating the reports on the several types of crowns (Table 1e), it was readily apparent that the dowel and ferrule type is not too generally in use in the dental school clinics of today. Of 30 schools relating their student averages in crowns, only 14 disclosed the construction of dowel crowns, with an average of 1.03 per student.

With a degree of curiosity, a check was made to ascertain if, by chance, those schools reporting the usage of the dowel crown might not reflect a higher average in root canal therapy. However, there was little appreciable difference; those teaching the construction of dowel crowns averaged 5.78 teeth treated in the endodontia clinic, whereas the general average, you will recall, was 5.06 teeth treated.

There was nothing of outstanding significance in the enumeration of student averages in full and partial veneer crowns, with the possible exception that the overall average for the full veneer was found to be somewhat greater than that of the partial veneer, 3.07 full veneers to 2.74 partial veneers per student.

Considering cast crowns as a whole, and based on the reports of 30 schools, clinical instruction in the preparation and placement of crowns is restricted to the senior clinic in six schools only. However, it was noted they are constructed in greater numbers during the senior year. The overall average for all types of cast crowns may be entered as 5.65 per student.

An examination of the overall tabulation of all types of bridges shows no unusual tendency. As would be expected, there is greater activity in this field by the senior student, who averages 3.24 bridges, while the overall average of 30 schools reporting was found to be 4.21 bridges per student, the high being 12 and the low one bridge. Seven schools appear to confine all clinical bridgework to the senior clinic, while in the remainder the activity is shared by juniors and seniors.

The overall average for posterior bridges was shown to be 2.74 per student, while that of anterior bridges may be set at 1.66 per student.

Ten of 24 schools revealed the construction of posterior bridges during the senior year only, while 11 of a like number of schools accounted for the placement of anterior bridgework by seniors only.

Denture Prosthesis

In reviewing the tabulations pertaining to student average clinical achievement in denture prosthesis (Table 1f), one observes that 33 schools reported student averages in the construction of full upper and lower sets of dentures. One school disclosed this activity being participated in by freshmen, while four schools reported the sophomores participating.

In a great majority of the schools this activity is shared by the junior and senior classes. However, in one school clinical instruction in this area of denture prosthesis appears to be confined to the juniors, while in another, to the seniors only.

A study of the tabulation indicates an overall average per student of 6.15 complete sets, the high being 14.16 and the low 3.

Turning our attention to single upper or lower dentures, we find here again some clinical activity, though to a lesser degree during the freshman and sophomore years. One school reported an average of one single denture per freshman student, another replied with an average of 0.07 singles per sophomore.

Six schools accounted for the construction of single dentures during the senior year only, while one school revealed such clinical instruction during the junior year only.

Based on the reports of 28 colleges, the overall average per student for single dentures has been posted as 2.01, with 3.5 as the highest and 1 as the lowest average per student.

Thirty-five schools reported on partial denture, in which the clinical instruction was preponderantly limited to the junior and senior classes. However, 12 schools appear to confine such clinical instruction to the senior clinic. Three schools reported sophomores participating in this clinical activity to a limited extent, the average being 0.93 per sophomore.

The maximum average per student was reported to be nine partials, the minimum being placed at one, with an overall average of 3.37 partials per student.

The matter of repairs and rebases may be disposed of with the statement that such clinical activity is largely restricted to the junior and senior students, only three schools reporting repairs and two schools rebases by sophomores.

An overall average for repairs was found to be 3.21, the high being 6 and the low 0.026, while that for rebases is 1.68 per student, with a high of 7 and a low of 0.001.

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Schools	DENTURE PROSTHESIS																							
	Full Dentures					Single Dentures					Partial Dentures				Repairs				Rebases					
	Fresh.	Soph.	Jr.	Sr.	Total	Fresh.	Soph.	Jr.	Sr.	Total	Soph.	Jr.	Sr.	Total	Soph.	Jr.	Sr.	Total	Soph.	Jr.	Sr.	Total		
YK			4	2	6				3	3			2	2		2	2	4		2	2	4		
OK			3	3	6			1	1	2			2	2		3	2	5			2	2		
KL			3.75	.51	4.26			.26	1.31	1.57			2.12	2.12						.30	.26	.56		
TK			1	3	4				1	1			2	2		1	1	2			1	1		
KC			3	3	6			1		1		1	2	3			1	1			1	1		
KE			7		7			1	2	3			5	5		3		3		2		2		
AK					3					1.25				2.23				1				1		
KG			2	4	6			1	2	3		1	2	3		1	1	2		1	1	2		
VK			1	3	4			1	1	2		1	3	4		1	1	2			1	1		
KI			1	3	4				1	1			1	1			4	4			1	1		
XK			2	2	4				1	1			2	2		2	2	4			1	1		
RA		3	6	4	13	1				1	1	5	3	9	1	3	2	6	2	3	2	7		
FR			3	4.50	7.50			2	1.50	3.50			3.30	3.30		5	.50	5.50						
RN			.71	3.89	4.60			.13	1.19	1.32		.25	2.35	2.60							.13	.13		
GP			1	3	4				2	2			2	2							1	1		
PE			3	6	9			2	3	5		1	4	5		4	2	6		1	1	2		
XP												2	3	5		1	2	3			1	1		
PO			1	3	4			1	1	2			2	2		1	3	4		1	2	3		
SV			3	3	6			1	1	2		1	1	2		3	3	6		1	1	2		
WS			1	4	5			2	1	3		2	2	4		2		2			1	1		
SS				7	7							5		5										
SG		1	2.50	3	6.50			1	2	3		3	4	7		2	1	3			1	1		
JS												1	3	4		2	1	3		1		1		
SQ			1	2	3			1	1	2		2	1	3		2	2	4		1	1	2		
AS					3					3				2										
SM			2	2	4				1	1		1	1	2		2	2	4		1	1	2		
ZS			1.10	1.50	2.60			.40	1	1.40		1	2.80	3.80		.60	2	2.60						
SO		4.23	6.57	3.36	14.16						.56	1.89	1.38	3.83	.98	1.11	.76	2.85	.06	.44	.42	.92		
DS	2.96	2.27	.07	6.52	11.82		.07	.05	1.20	1.32	1.23	1.82	3.12	6.17	.0016	.003	.022	.026			.001	.001		
NH			2	3	5			1	1	2		1	2	3		2	3	5		1	2	3		
HU			1	2	3								2	2										
FH					4					1				3				2				2		
HZ			5	6	11							1	4	5		1	1	2		1	1	2		
QH			4	8	12								2	2			1	1			1	1		
HB			5	3.50	8.50			1	1	2		1	2	3										
Total	2.96	10.50	76.70	102.78	202.94	1	.07	17.84	32.20	56.36	2.79	33.96	74.07	118.05	1.98	44.71	40.28	89.97	2.06	16.74	26.81	48.61		
Average	2.96	2.62	2.64	3.54	6.15	1	.07	.99	1.40	2.01	.93	1.70	2.39	3.37	.66	1.94	1.68	3.21	1.03	1.19	1.07	1.68		

TABLE 1f

Comments

Within the questionnaire there was a question, "Do you have a quantitative requirement?" It is not within the province of this paper to discuss quantitative requirements, but the above information was solicited for the purpose of ascertaining, if possible, whether or not there might be some correlation between student clinical achievement and requirements.

Twenty-four schools answered in the affirmative (Table 2), in some or all clinical divisions, and seven answered negatively. Practically all answering affirmatively recorded requirements in the so-called "major" clinical divisions—operative dentistry, crown and bridge and denture prosthesis. With such information, a comparison was made of student averages within these divisions, as compiled from statistics obtained from schools with and without a quantitative requirement.

It was most interesting to note a greater student average achievement, in each of the above three divisions, within those schools not having a quantitative requirement, than in those having such a requirement. Curiously enough, those schools not having a quantitative requirement show a lower overall average number of hours (Table 2) devoted to clinical dentistry than do those schools reporting a requirement.

The overall average number of hours (Table 2) devoted to clinical dentistry, as a whole and divisionally or sectionally, in the curricula of 23 schools has been recorded for your study and comparison. In general, it may be stated, there appeared to be no definite correlation between the number of hours in a curriculum devoted to clinical activities and the overall averages of student clinical quantitative achievement.

It is conceded there are many things which may influence the quantitative achievement of our students, among which are patient cancellations, failures and tardiness, student, staff and personnel illness, student-staff ratios and availability of suitable clinical teaching material. However, since this report is based on averages throughout our schools of dentistry, and since the influences above-referred to are not peculiar to any one school or group of schools, the averages as reported by the several schools should be recognized as subjected to the same influences, and therefore achieved by the respective students on the same basis.

Summary

In summarizing the tabulations herein presented, suffice it to say a student's average quantitative clinical achievement in the "average" dental school would consist of 120.22 restorations in operative dentistry, 44.28 in pedodontics, 53.43 hours of mouth hygiene, 64.69 hours in periodontics, 7.07 dietary surveys, root canal fillings placed in 5.06

NUMBER OF HOURS IN CURRICULUM DEVOTED TO CLINICAL ACTIVITIES

Schools	Quantitative Requirement		CLINICAL DIVISIONS AND SECTIONS												Grand Total Hours
	Yes	No	Oper.	Pedo.	Endo.	Mo. Hyg.	Perio.	Ceramics	Cr. & Br.	Dent.	Ortho.	Oral Surg.	Oral Diag.	X-Ray	
YK	X		378	40	34	70	42	10	240	286	40	64	52	52	1308
OK			519	135	78	45	72		a*240	260		134	60	45	1588
KL			350	110	75		175	60	225	275	24	75	81	33	1483
TK	X														
KC	X														1200
KE	X		672	168	56		b*112		a*336	504	42	252	168	168	2478
AK	X														
VK	X		540	165	25	34	80	12	84	224	50	84	70	40	1408
KI	X		a*225	80	25	45	110		198	260	35	30	30	40	1078
XK		X	450	120	30	23	45	3	75	258		30	50	28	1112
RA	X														
FR		X	c*910	40			60				60	60	18	30	1178
RN		X	540	90	27	65	63		a*270	315	d720	108	12	44	1534
ZR							150								
GP	X		305	245	40		245	25	230	340	120	145	50	50	1795
PE		X	300	150	15	30	15	15	30	160	100	50	15	25	905
XP	X			40	70	60	104	60	170	368	192	120	18	77	
PO	X		450	120	30		b*90		a*180	450	90	60		e*30	1500
SV	X		320	99	60		83		a*256	256			128		1202
WS	X		425	100	20	85	40	10	110	250	30	110	55	42	1277
SS	X		f*470		55		70		a*69	166	55	35	13	70	1003
SG	X														
JS	X		272	100	50	150	100		a*300	300		138	28	50	1488
SQ	X														
SM	X		590	145	14		b*150		160	a*388	64	106		e*138	1755
ZS	X														
SO	X		510	120	30		90	12	270	480	12	75	30	30	1659
DS		X													
NH	X														
HU	X														
FH		X	338	116	7	25	70		a*151	291		70	15	60	1143
HZ	X		g*955	151	100	50	50			388	68	130	100	76	2068
QH	X		638	100	40	50	30	30	230	215	12	130	50	25	1550
HB		X	f*810		10	70	40	12	36	180	4	156	80	60	1458
Total	24	7	7597	2434	891	802	1734	249	2058	6226	998	2162	1123	1045	33170
Average			447	116	41	57	83	23	158	296	59	98	53	52	1442

a—Includes ceramics.
b—Includes mouth hygiene.
c—Includes crown & bridge, ceramics, denture, mouth hygiene and endodontia.
d—Special undergraduate course, hours not included in totals or average.
e—Includes oral diagnosis.
f—Includes pedodontia.
g—Includes ceramics and crown & bridge.
*—Omitted from total and average.

TABLE 2

teeth, the extraction of 97.06 teeth, 3.2 porcelain or acrylic crowns and inlays, 5.65 crowns of various types, 4.21 anterior and posterior bridges, 6.15 full sets of dentures, 2.01 single and 3.37 partial dentures and 4.89 denture repairs and rebases, during a total of 1442 hours devoted to clinical activities, which also includes time spent in clinical orthodontics, oral diagnosis and oral roentgenology.

In conclusion, I wish to express my very sincere appreciation for the splendid assistance of the deans and members of their staffs, who so generously responded with the information from which this report was compiled.

Discussion

DONALD A. KEYS, A.B., D.D.S.,[1] *Lincoln, Nebraska*

It is interesting to note that the objective of the paper is to make available the average amount of clinical experience received by our undergraduates, and not to set a standard or a figure for accomplishment. The study is most comprehensive, and of special interest is the finding that those schools exacting quantity requirements do not show the highest performance figure in production. This is an observation that should require our attention. A certain amount of experience is desirable, of course, and this finding challenges us as to how best achieve the goal. The study includes 36 schools reporting and should be quite reliable. In several cases of reports on divisions, there seems to be an extremely wide variance on quantity returns in different schools. For example, a low of 65 restorations compared to a high of 246 is noted. However, 120.22 average seems more reasonable and desirable.

The report of only four colleges at present offering clinical work to sophomore students, against 16 reporting sophomores receiving clinical cases in 1944, may show either a discrepancy in reporting, due mainly that it was the time of accelerated programs; or perhaps there may be a discontinuance of clinic instruction for sophomores.

There is a wide variation in the number of hours devoted to clinical pedodontia with a recorded 245 high and 40 low. Eight inlays per student in one school seems rather unusual, and the indication for two gold foil restorations per student is an interesting observation. The variance of 175 hours maximum to 3.5 hours minimum for mouth hygiene is noted.

The fact that 27 schools of the 36 reporting gave time for clinical endodontia shows that some schools evidently do not have separate

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instruction for the course, or combine it with others. Thirty-one hours seems quite low compared to a high of 225 for clinical endodontia. It is revealing to know that 17 schools limit clinic instruction and practice to teeth anterior to the molar teeth. Treating 15 teeth in clinical endodontia would seem to take much clinical time even with the average of 7.82 hours per tooth. This would take roughly 120 hours of clinic time. It is surprising to find that 7.84 hours per tooth were consumed in ten schools permitting the treatment of molar teeth. The final figure gives 7.83 hours per treatment for any tooth. The variance of 325 high and 22 low for surgery (extraction) is an interesting observation.

Ceramics, instruction and clinical work, was confined to about 17 schools. Acrylic restorations are seldom used, according to the survey. Fourteen schools report the use of the dowel crown. The performance figures with reference to the dowel crown and endodontia show very little variation. The average of 4.21 bridges per student seems to run about normal with the high of 12 seeming exceedingly high.

In the construction of dentures the overall high of 14.16 complete dentures may be influenced by the use of laboratory technicians. Otherwise this figure appears high for quality work. The average of 6.15 completed sets of dentures runs true to the expected figure. Also the high of nine partial dentures would seem excessive, but the average of 3.37 levels it to a more normal figure.

In conclusion, it is found that there is no definite correlation between number of hours in a curriculum and clinical quantitative achievement, and that schools having quantity requirements do not necessarily show greatest production figures. Organization, case planning, diagnosis, supply dispensing and general clinic efficiency, may have a bearing on all these figures. The general average in the different divisions seems quite well distributed when detailed study is made of the Grand Total sheet. The time devoted to these divisions and the experience received in clinic instruction for our students can be determined very readily from this complete study.

THE EFFECTIVE APPLICATION OF BIOLOGIC SUBJECTS IN CLINICAL TEACHING[1]

JOHN H. BARR, D.D.S., B.Sc.Dent.,[2] *Boston*

The problem of presenting applications of basic scientific knowledge in the course of vocational teaching is by no means peculiar to dental education. In fields such as industrial technology there is close association between the scientific explanations of various phenomena and their direct applications in manufacturing or engineering practice. Long before educators pondered the problem facing us today this background inspired the traditional coordination of principle with application which has characterized the teaching of basic physics and chemistry. The chances are that no matter how long ago we took high school chemistry, we are able to recollect a conducted tour of the local gasworks plant while we were studying the elementary chemistry of carbon and its combustion products. But even in the field of engineering, based upon relatively exact sciences, we discover that vocational education may not always be determined in terms of the established data of relevant fundamental studies. For one hundred years railroad construction engineers continued to lay their track in carefully-spaced 39-foot rail lengths. Although dictated in part by convenience of transportation on regular flatcars, this practice recognized the ominous scientific prediction that longer sections should twist and buckle disastrously with upward variations in temperature. Then from a bold and unorthodox experiment not more than a decade or so ago, there followed the growing and successful practice of laying continuous welded sections of rail measured in miles instead of in feet.

The illustration points to certain reservations associated with a literal interpretation of the findings of comparatively exact sciences. When we turn our attention to the field of biology, broader qualifications are found to apply to the translation of basic knowledge into clinical practice. Scientific prediction of the outcome of any given procedure remains no less desirable, but becomes incomparably more difficult to establish. The body of well-substantiated basic knowledge is so much less complete or adequate; and there is the additional factor of a normal individual variation for each situation. No matter how far our enquiry progresses into the nature of life and disease, it appears that the application of demonstrated biologic facts will forever require to be tempered with

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[1]Presented before the Section on Clinic Administration, American Association of Dental Schools, annual meeting, March 28, 1950, French Lick Springs, Indiana.

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those personal evaluations and judgments which collectively form the art of dentistry.

It remains true that the further we are able to extend the application of scientific knowledge into clinical practice, the more successful we may expect our professional activities to prove. The desirability of relying more on objective findings and less on personal evaluations provides the cue for untiring endeavor to extend the body of knowledge basic to our sphere of activities, to understand the potential import this knowledge holds for us, and to translate its growing significance into more effective and more predictable technics for the prevention and treatment of dental ills. Upon the teacher in dentistry falls the prime responsibility to encourage a logical application of known facts to clinical procedure.

It would seem well to set up as an objective the development of an *attitude* in our students rather than to attempt the direct or literal teaching of specific applications of biologic subjects to clinical practice. The progress of student learning will then have to be judged in terms of the intangible characteristics of a developing scientific attitude rather than by evidence ability to assimilate and regurgitate a long series of examples in which principles and their applications may have been integrated in the course of teaching. The best of such examples will come to represent a means rather than an end in the philosophy of dental education.

Once the student is able to appreciate that dental practice is experienced at its most satisfying level when concerned with phases relatively well-comprehended, real progress has been made. From this point onwards, exploitation of the innate curiosity of the human being will prove educationally the most successful technic towards the realization of our teaching objective. No comparable results can follow from a fetish of routinely presenting basic principles in company with their associated applications. The latter plan will have served its purpose once a sufficient number of well-chosen examples have been utilized to suggest the pattern for continuing original enquiry on the part of the student. Success in our efforts will be within sight just as soon as the student himself commences to ask "Why?" in addition to the more obvious "How?" and "When?" and "Where?" as applied to the actual situations with which he is confronted in the clinics. Should we not therefor seek opportunities, less for presenting principle and application in company with each other, than for the stimulation and encouragement of a scientific approach to clinical problems? There is of course a corollary to this postulate, in that whenever a student is prompted to seek the

rationale for a clinical procedure, an adequate explanation should be readily available to him if he is unable to find his own answer.

There will not for every case be an answer in the form of a rationale logically developed from biologic teaching. We do not need to search deeply into everyday experience to find many clinical procedures which have no better basis than pure empiricism. It is better to admit this to the student than to frame ill-supported pseudo-scientific explanations. On the other hand there are many convincing examples of direct relationship between clinical procedure and basic scientific knowledge; these comprise positive opportunities to stimulate the attitude with which we seek to imbue dentists of tomorrow.

Between the empirical and the scientifically-based activities of practice there is an unfortunately large area characterized by a confused admixture of unsupported theory and partial scientific claim. An appropriate illustration could be the intermaxillary relations during jaw movements. Prosthodontists and orthodontists are all too familiar with the irreconcilable theories of those who have sought to elucidate the full facts of the movements of the jaws and their changing occlusal relations; applied to practice, none have yet succeeded in faithful reproduction of mandibular excursions. This type of situation need not deter us from using the opportunity even though in a sense it is negative. An incompletely successful technic implies an inadequate biologic or biophysical basis, which in turn invites the aroused curiosity of a student to manifest itself in the form of a potential research worker; or at a lesser level of intensity, in the form of a scientifically critical attitude which may be relied upon for sound appraisal of present and future technics.

How can we turn all these opportunities to good account in the course of clinical teaching? It seems that no educational technics have been evolved which are specifically suited to the purpose. In many fields of educational practice, teachers are groping as we are for an answer to the problem; unfortunately so far as can be learned their experience offers no original assistance for us. In the emerging science of education, controlled experimentation relevant to the problem is conspicuous by its absence; but the trend of educational philosophy does indicate an ultimate scientific development of efficient methods to meet our teaching needs. Until this long-range hope becomes reality it seems that our attention will be confined most profitably to a close examination of the apparent results of our own experience.

With this modest plan to determine the scope of study we shall essay an evaluation of teaching technics which seem to have been useful or which hold promise of being helpful. Few of them will be new to any

one of us; but their discussion may provoke an interchange of ideas through which their range may be extended, to register here and there the slight net advances in specialized educational technic with which we must be content for the time being. Some day the science of education will have progressed to the point where we can expect more able direction for our teaching activities.

Recent emphasis on the value of presenting clinical applications at the time basic sciences are taught, drawing on their interest appeal for the motivation of basic learning, is valuable enough so long as too much is neither attempted nor expected from it. The intricate clinical activities of dentistry defy adequate comprehension on the preliminary acquaintance possible in freshman or sophomore years; and they are need seldom based in large part on the one basic principle whose applications they may be presented to illustrate. It seems facetious to look for any considerable appreciation of the coordination of principle with application until the student may have had more ample opportunity to appreciate or experience *both* of the factors to be coordinated.

More far-reaching proposals which would involve the student in actual clinical practice during freshman or sophomore years give cause for our concern as clinical teachers. It may sound impressive for a school to proclaim that its students engage in clinical practice almost from the day they enter its doors, and it is not without dramatic appeal to the student. But it does not seem to guarantee either a superior interest motivation for basic learning, or an ultimately higher standard of clinical ability. Many clinical skills may certainly be acquired by purely repetitive learning, a fact which is convincing argument for those who today advocate the training of auxiliary personnel to relieve the dentist of technical chores. But should a professional student too early acquire confidence to manage a variety of clinical situations, he may well come to question the need for his later study of the basic knowledge which would otherwise have preceded technical learning. Proposals of this kind presuppose emphasis on the achievement of the technician, a philosophy which should not merit prominence in a professional environment. Clinical teachers become involved in new problems which appear to be the very negation of efforts to coordinate biologic subjects with our teaching, ignoring well-established educational principles which prescribe that the learner must first be acquainted with the basic information upon which, in an orderly progression of steps, a total (clinical) concept may be built. The culmination of this process, the over-all integration of the component parts of a total concept, must await the comprehension of all its parts.

At the risk of being reactionary, it is pertinent to plead therefore that

further evolution of the more orthodox plan for the curriculum should take place in a manner designed to rid it of some inconsistencies which remain to this day. The spectre of a dental teacher confronted by the prospect of attempting to teach tooth preparation and restoration before his students have studied the pathology of caries is not a myth—it is but one of too many contemporary teaching situations. Should not our educational practice conform more closely to our preaching of the concept that the basis for clinical technics should wherever possible be fundamental scientific knowledge? There seems a strong case for revision of the curriculum so that starting with study of normal structures and functions, and always proceeding from general to special or oral, it will then proceed to unfold the picture of disease. From that point the rationale for therapy may be developed and progressively expanded into the detail of actual technic and practice. On this plan, could we not exploit more fully the intelligence of the student? And would not the problem of associating basic principles with logically developed clinical practices become a "natural"? A much better job in orientation of the student, overdue in any event, would be called for through the years of basic studies, but we could hope to avert much of the confusion often evidenced vociferously by freshman and sophomore students—confusion which will not be lessened by proposals for the premature introduction of clinical activities.

Should the earlier introduction of the student to clinical practice deserve further consideration for other reasons, there is a challenging alternative approach which, so far as can be learned, has not passed beyond the blueprint stage. For this there are obvious reasons in the form of the unusual administrative difficulties in its execution. The plan implies a "vertical" integration of "topics" while preserving within each the proven "horizontal" progression of "courses." Following the briefest possible period of general studies, the student would proceed to learn first the scientific facts fundamental to a selected clinical "topic" or situation, and then pass to study of the rationale and technic involved in its clinical management. For instance in considering the topic of local anesthesia, his first teacher might be the anatomist, followed in succession by the neurologist and the physiologist, the pharmacologist, perhaps the teacher in treatment-planning, and finally the clinician responsible for demonstrating local anesthetic technics. There would be need for very careful selection of the sequence in which "topics" should be presented; but if the demand for early introduction of students to patients becomes more insistent, the experimental investigation of this form of educational approach will become an urgent matter. It is difficult to conceive how

else the student could be permitted an early introduction to the less intricate clinical procedures without sacrificing an orderly progression of his learning. Dental education may well refrain from exposing students prematurely to direct clinical learning until and unless such plans embrace adequate safeguards for preserving the principle of "first things first."

Through the customary clinical years of the curriculum, we find a variety of situations awaiting study. It will be readily conceded that no clinical teaching holds such promise as that which may take place at the chairside. Other opportunities are not unimportant however, and under existing conditions must be relied upon to support chairside instruction to a greater extent that we would wish. The much-maligned lecture method provides a fine opportunity indeed for setting the stage or background against which all other clinical teaching will take place. At the clinical level we can afford within fairly wide limits to allow student interest and curiosity to determine the content of a lecture series. Growing awareness of shortcomings in his knowledge and experience will be found to assure a ready response to requests for discussion topics. The alert instructor can exploit this opportunity to advantage, continually emphasizing the question "Why?" in his discourses. And while it is educationally sound for the teacher to pose the question, it is still better that the student should come to ask it. The seminar, too often impractical in these days of large class enrollments, is ideal for stimulating the idea of a dependence of clinical activities on more basic studies. In the seminar, not only can the student give full play to his own questioning, but he may be spurred into devising his own explanations.

Chairside instruction offers the opportunity to pursue our purpose to its ultimate objective. Here is the great challenge to the clinical teacher, who must seek to elicit from the student operator not only evidence of technical accomplishment, but the rationale on which his actions are based. The opportunity is limited only by the time available and by his own adequacy of preparation for an academic mission. The great need is for teachers sufficiently numerous, of adequate professional calibre, inspired with the concept that technical accomplishment by itself will not suffice to prepare the student for a professional career. Such teachers will see to it that, as graduation approaches, the student assumes an increasing responsibility for his decisions and his technics, at the same time continually encouraging in him an attitude of introspective and critical examination of the rationale on which his actions are based. There seems to be no end to the openings for this pursuit, be it concerned with diagnostic problems, the preliminary planning of treatment, the evaluation of possible preventive measures, the rationale

of surgical removal of disease in tooth or jaw, the selection of drugs for medication, the manipulation of restorative materials having regard both to their intrinsic properties and to the protection of living tissues, the design of removable restorations or any other of a host of instances in every aspect of dental service.

It is not suggested that these opportunities have escaped our notice, but the teaching in our clinics could be enhanced by more deliberate and sustained efforts to extend their range and to utilize them more fully. Could we not with advantage, at each time a technical operation is being checked, explore with the student at least one aspect of the basic rationale for the work in hand? At first the initiative would have to be taken by the instructor; but example is a powerful influence, and experience has shown that before long the appropriate question will arise in the mind of the student, so that he tends to assume the initiative in finding a basis for what he is doing. Again, could not our policy governing the selection of drugs and restorative materials (for availability in the clinics) be turned to good account for teaching purposes? The recent scramble to use self-curing resins appears to deserve attention as an example. It is almost incredible that here we have been urged to introduce in our clinics a new material for restorative purposes, before such elementary physical properties as the range of dimensional changes have been forthcoming. The issue is not whether the material is well-suited or ill-suited to our clinical purposes—all along we have been using materials of both kinds. The key to the situation lies in our responsibility to demand, as a prerequisite to acceptance for clinical use, basic information sufficient for the preliminary evaluation and intelligent employment of *any* restorative material. If we settle for anything less, the student from whom we have earlier required intensive study in the basic field of dental materials will be entitled to feel that his time and effort was spent in vain.

At one of our schools the basic science teachers are required to accept assignments in the clinics in the capacity of consultants. A program which so closely associates teachers from biologic subjects with clinicians at the chairside holds intriguing possibilities. We can be sure that the observation of clinical activities by basic science teachers, and the challenge to them involved in meeting problems raised in clinical consultations, will not only impress students in a desirable direction but brings these teachers into first-hand acquaintance with dental problems. This is valuable assurance that their primary responsibilities in preclinical teaching and research will be more intelligently met. We are viewing

an educational experiment which invites consideration of an extension of the idea into the lecture room and, of course, the seminar.

Since the time when departments of surgery, "clinical" dentistry and prosthetics were thought sufficient in clinical administration, the orthodontist, the crown and bridge specialist, the radiodontist, the periodontist, the pedodontist and the endodontist have all succeeded in claiming in fact if not in name separate divisions or departments for their clinical teaching. It is not surprising that another was then added in the form of that dual personality, the teacher of diagnosis and treatment planning, charged with the responsibility of reassembling the scattered fragments of the fabric of clinical teaching.

Diagnosis has evolved into a potentially useful teaching discipline for which an effective educational technic is slowly taking shape. One of the appealing attributes of diagnostic teaching is to be found in the direct manner in which it draws upon basic studies through all the steps involved in the collection, correlation and interpretation of examination findings. But the teaching of diagnosis at the clinical level shares with other fields the experience that demonstration cannot substitute for chairside learning. This suggests a program in which the student who is destined to treat a case should be the one who has been required to interpret examination findings and develop the individual rationale of treatment for the patient. For similar reasons it is well that, wherever possible, one student should provide all phases of treatment for the patient. The case is being made for a decentralized activity in the teaching of diagnosis, in which the instructor in this aspect of practice will forsake the demonstration room early, and concentrate his efforts at the chairside in the clinics.

But if Dr. Jekyll has proved valuable as the teacher of diagnosis, Mr. Hyde the master treatment-planner has in most cases suffered an inevitable fate. His responsibilities have been returned for the most part to those who also have to answer for the execution and effectiveness of an outline of treatment, to all intents and purposes limiting the scope of treatment planning in its broader aspect to interdepartmental consultation. This is a far cry from the circumstances in which a student will find himself planning treatments the day after he graduates. Among the many grounds for dissatisfaction with this teaching situation, our special concern at the moment stems from the fact that the phase of treatment planning implies, more than any other, a process in which basic studies are translated into a rationale for their clinical application. Yet we find responsibility so widely distributed, divisions so arbitrarily

fixed and interests so divergent that alarming gaps and conflicts in teaching abound to confuse the student.

We are led to ask ourselves whether at the undegraduate level there is genuine need for so many—perhaps for any—divisions in a clinical teaching set-up. At least one school has set about to seek an answer for this question by associating the student for half of his clinical time with a carefully selected general practitioner as his instructor in all phases of clinical practice. Emphasis on the departmentalized teaching of technical operations is in this manner replaced by emphasis on overall dental health service or comprehensive treatment for the patient. Here for the first time we find a chance to center in one preceptor a clear responsibility for instilling a scientific attitude in those students assigned to him.

No matter how we may have set about the development of student attitudes, the extent of our achievement will almost completely defy objective measurement. It may be of little moment that we cannot endow the student with a formal grade based on his scientific maturity; we are still left with the problem of measuring his development so that we may discover for ourselves how well we are succeeding in this phase of teaching.

We can attempt to measure the response to examination questions carefully devised so that they will draw on the originality of thought we have sought to stimulate. That is to say, the answers will not be found verbatim in textbook or lecture notes although the basic material must have been presented. Other than this, until an acceptable technic has been devised for measurement of personality traits, it will be necessary to rely on little more than personal evaluation of the overt responses to problems arising in the classroom or clinic. These will reflect some measure of a developing scientific attitude.

In conclusion let there be a definite assertion of the urgent need to stimulate more active use of the basic resources with which the student has been provided. The increasing cost of professional education is contrary to the unanswerable and insistent demand for a wider availability of dental health service to the public. The layman will more readily accept the need for extensive basic preparation of the dental student when its value is conveyed to him in the form of higher standards of professional service. Basic studies are wasted on the dentist, and the patient cannot therefore reap the benefit, unless they are kept alive through constant recall. In the final analysis the close integration of biologic subjects with their clinical applications will determine their role in dental education. The onus is clearly on the clinical teacher.

PATIENT REHABILITATION AS A FACTOR TO BE CONSIDERED FOR EFFECTIVE CLINICAL TEACHING AND PRACTICE[1]

ROGER E. STURDEVANT, D.D.S.,[2] *Atlanta*

In the dental educational field there has been a great tendency to develop some departments in our schools that are best with either good physical equipment, excellent instructoral staffs, or both, at the expense of other departments.

This is answered every day by students graduating from our schools. We never question their loyalty to the school from which they graduate, but they are very honest in their convictions as to what constitutes a balanced dental education.

How often do we hear the graduate speak of the over-emphasis of the technical training at the expense of the basic sciences or we hear them speak of the over-emphasis of the basic sciences at the expense of the technical training?

With full understanding that a dentist is called upon to render a service which involves a great amount of technical skill, we must never lose sight of our responsibility for the student's failure to grasp the importance of a complete dental health service.

Too many students are graduated with the line drawn too sharply between clinical and so called pre-clinical teaching. Why should a student ever be left with the thought that certain subjects in the dental curriculum are only set for a definite hurdle for him to clear in order to get to the practical training in the clinic?

Should basic science subjects be taught on a strictly horizontal level and forgotten by the student as soon as his grade in the subject has been recorded?

Should the instructor in the basic science course be released from his responsibility of applying the course content on a vertical basis throughout the entire undergraduate study?

The basis on which the national board is offered certainly lends itself to a gross misunderstanding of the application of the course content of the first two years of undergraduate study to a well balanced clinical training.

By giving the examinations on the science courses at the end of the sophomore year we are again implying to the student that the courses

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[1]Read before the Conference Session on Clinic Administration at the American Association of Dental Schools Meeting, held at French Lick Springs, Indiana, March 27-29, 1950.

[2]Emory University, School of Dentistry.

are just basic, thus, too little emphasis is put on the true value of applied science when rendering a complete dental health service.

To apply the principle of a complete dental health service in our undergraduate study in the college of dentistry of Emory University, the patients are accepted on the basis of cooperation for a complete rehabilitation service.

With the exception of patients applying for an emergency service the routine procedure calls for an understanding with the patient as to what constitutes clinical material for teaching purposes. If the patients are unwilling to cooperate in our complete program they are dismissed, thus eliminating to a certain degree the amount of broken student-patient relationships.

In preparing a student to meet the problems which confront him after graduation, we at Emory feel that one of our greatest achievements in a teaching program is to establish a greater confidence, on the part of the student, to accept the challenge of rehabilitation.

In thus accepting the challenge of rehabilitation, he is certainly called upon to apply all of his knowledge of the basic sciences. This procedure also lends itself to the vertical teaching of the basic sciences as it calls for a close cooperation of all the departments to complete such a service.

The assignment of patients rests entirely in the hands of our diagnosis and treatment planning department. After the classification of the patient has been made, the selection of the student is made according to the teaching material present. Instead of the assignment of patients for the sole purpose of satisfying point requirements in a specific type of technical teaching, the assignments are made to give the student a well balanced program. By and large this method is proving to be very satisfactory. The over all experience and clinical accomplishments are studied closely at the end of the junior year in order to make assignments for their senior program which will complete the rehabilitation picture in all aspects.

After the assignment of a patient, the student makes out an assignment slip, which in turn is placed in the hands of a record clerk who registers the patient on his page of assignments.

This procedure gives the clinical teaching staff a definite record of each student's responsibility for patient assignments, as the student must show his ability to render a complete service to the patient as well as to demonstrate his technical ability.

A large premium is paid to a student who can demonstrate his ability to render a complete rehabilitation program. After all of the departments are satisfied with the treatments rendered in their sections, the student

returns the patient to the diagnosis and treatment planning department with all of the records which include postoperative bite-wing radiographs. This program gives us a complete check of all the treatment that has been carried out in giving the patient the complete service, but, it also acts as a great stimulus in having all of the departments of the school very active in this clinical teaching problem. To further promote wonderful student-patient relationships, the rehabilitation is graded as an over all program and the student receives extra credit in the type of service which is used in carrying out the treatment planning.

PREPARATION OF STUDENTS IN THE TRANSITIONAL PERIODS[1]

HECTOR R. MacLEAN, D.D.S.,[2] *Edmonton*

The dental undergraduate prior to the last decade found his course divided into two main parts, the preclinical and the clinical. During the last ten years there has been a concerted effort on the part of many teaching staffs to coalesce these phases so that the student may experience a minimum feeling of change in passing from the first to the second stage of learning. Our aim then, is to arrange a continuity in preclinical and clinical work and to correlate all curricular phases to the point where the student should not be conscious of this transition. How can this be accomplished?

Many excellent articles have been written on this subject in recent years by such men as Craig, Flemming, Hatch, Nuckolls, Keys, Rochon, Van Leeuwen and Person. These papers have been published in the *Journal of Dental Education* and no doubt have been studied by those present. I should like to outline to you some of the approaches we have made to a solution of this problem at the University of Alberta. These have not given the complete answer and we are always ready to institute changes in the curriculum where improvement is indicated.

Let us consider the selection of the applicants for dentistry. These individuals come to us with a fairly complete record of their academic achievements. To this we add a personal interview and a simple aptitude test. All are interviewed by an admission committee; some are required to give a more detailed account of their background and interests. Inquiry is made into the manner in which the applicant has met challenging situations in the past and how he has adapted himself to them. He is

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[1]Presented before the Section on Clinic Administration, American Association of Dental Schools, Annual Meeting, March 28, 1950.

[2]Professor, Operative Dentistry, University of Alberta.

questioned as to why he wishes to study dentistry, his ambitions in the field, seriousness of intent and amount of effort and energy he is willing to expend. Although manual dexterity tests have never reached the stage whereby they are sufficiently conclusive to determine the acceptance or rejection of an applicant, their value may lie in confirming an opinion of the student's ability, or lack of it, as he proceeds through his freshman year. Numerous articles in dental educational literature throughout the past twenty years have stressed the fact that one of the chief aims of professional education is to establish a knowledge of the normal in various stages of growth and development and a biological attitude toward the study of disease. A background indicating an inquiring type of mind and a desire for continued learning may be uncovered in the interview. We recognize the fact that the student should apply curiosity, inquiry, and reasoning to the study of a profession. However, so much emphasis has been placed on this aspect of the educational program in the last decade, that in the process of adjusting the curriculum, the practical teaching is continually being sacrificed. Is it not possible for the pendulum to swing too far in one direction? Until more is known about the control of dental disease, a considerable amount of technical excellence, together with a high degree of diagnostic judgment, is needed. The one without the other will not suffice. It is lamentable that some schools have seen fit to abandon instruction in the placing of restorations of the highest order. I refer to the use of gold foil.

At Alberta the basic health sciences, the faculty of medicine, and the faculty of dentistry are all located in the same building. Our dental students take their lectures and laboratories in the basic science courses with the medical students. A definite effort is made to correlate the basic science teaching with clinical practice. For example, in pathology the student is shown biopsy specimens from the clinic being examined in the laboratory. A biological technician on the dental staff does cultures and smears and prepares tissue sections in a department adjoining the operative clinic. Thus the student in his freshman year sees the practical application of these sciences.

Freshmen are given a series of ten lectures in orientation. A review of the curriculum, the history and organization of dentistry, the basic science courses, research, an explanation of equipment and disciplinary requirements are subjects included in this course. These are given by different members of the staff. Natural teeth are used as models in the latter half of the course in dental anatomy. Each student is required

to section various natural teeth in two planes to familiarize himself with the internal anatomy.

In the sophomore year practically all the preclinical operative and prosthetic work is done on articulated manikins which have the cranial features incorporated. Thus the student learns instrument grasps, rests, rubber dam and clamp application on a model that simulates the patient as closely as possible. The accepted clinical arrangement of instruments prevails in the preclinical laboratory. The proper use of the mouth mirror is required and encouraged. Supplies are standardized throughout the preclinical and clinical departments. Type cavity preparations are cut first in two and one-half times plaster teeth and then in natural teeth. Frequent demonstrations on patients, the added use of coloured still and motion films and progressive stage models enable the student to obtain a correct and concise impression of the operations. At this time the students are checked closely to assure that they are developing proper procedure and that they are not forming habits deleterious to clinical work. All instructors in preclinical laboratories also instruct in the clinic. Clinical lectures and demonstrations are given to sophomores on deportment, professional appearance, conduct, treatment planning and orderly sequence of procedure. During the final six weeks of the sophomore year the students are divided into two sections. One half are patients while the others operate. They perform elementary operations on each other in the clinic. Examination, charting, history taking, treatment planning, prophylaxis, sterilizing, rubber dam, clamp and separator applications, local anaesthetic injections and impressions are done under close supervision. At the end of the sophomore year they have acquired considerable familiarity with clinical surroundings and have repeated simple types of operative procedures to the point where they have an appreciable degree of confidence in their ability to render service to clinical patients.

Some mention should be made of the type of instruction given. A sympathetic and co-operative attitude of helpfulness and guidance is essential on the part of the instructor, rather than criticism or requests for repetition of work without suggestions for improvement.

Each member of the teaching staff subscribed to the *Journal of Dental Education*, the subscription being included in the staff fee.

Detailed outlines of courses are available so that each department can review material given by other departments and eliminate duplications. Study clubs formed within a department tend to promote a consistency in presentation of material and procedures.

The physical set up of the clinic should be such that it is convenient

to make frequent checks of operations in an efficient manner. From the beginning of the junior year until graduation the students, when in the clinic, are required to dress in white and are considered on a level with the internes in the hospital.

At the commencement of the junior year, individuals of high school or university age level seem to be preferable for initial patients. It is our experience that children require speed, direction and organization beyond the ability of the junior, while elderly people seem too impatient and require more complicated types of treatment.

The department of diagnosis and treatment planning examine all patients on their initial visits to the clinic and direct the uncomplicated cases to juniors. This procedure of patient assignment, together with frequent checking by the instructors, prevents the student from becoming discouraged and permits him to gain confidence at this critical stage. Regular demonstrations are given by the instructors at this time. A demonstration theatre accommodating fifty students adjoins the clinic. The three tiers of seats are in a semi-circular arrangement. The dental chair, unit and mobile cabinet occupy the centre. The students are supplied with opera glasses which bring the field of operation to within an approximate two-foot distance. The room is used by all departments. Frequently groups of six or eight are taken in for demonstrations. For the first half of the junior session the students are closely observed. A student, who is having repeated difficulty, is drawn out of the clinic for individual instruction and demonstration in an effort to locate and correct the trouble. Junior students have a rotating observational period in the diagnostic clinic where procedures of roentgenology, examination, consultation and treatment planning are demonstrated. Upon completion of treatment in the general clinic the patient returns to the diagnostic department where a second series of interproximal roentgenograms are made. This provides a check-up on work completed and furnishes added information on the standard and quality of the restorative service that has been performed.

The library is a department within the central library building adjacent to the dental school. A small theatre in this building is available for the showing of still or motion films. Projection cubicles are also provided wherein a student may project a series of slides on a chosen subject or an instructor prepare material for a lecture. These facilities permit opportunity for visual review of a technic or a study of a progressive series of films on a given practical case. Library periods are allotted in each year to encourage reading. Seminars are in common use.

Of course, the real transitional stage with which all of us are concerned

is the transition from the clinic to the office following graduation. We attempt to impress in various ways, the senior student with the close relationship between medicine and dentistry. He is on a rotating service in the diagnostic department in the school. He makes a clinical examination, takes a history, and does a complete roentgenographic survey of each patient registered. He later attends the consultation where the history is reviewed by an instructor, the roentgenograms examined, the clinical examination repeated, and the case discussed. A diagnosis and plan of treatment is then charted. Special tests are done either at the hospital or by a medical interne in the dental clinic.

The University Hospital is on the campus. There are seven operating theatres and a fully equipped dental room in the surgical section. The seniors are on two rotating services at the hospital. Here they spend at least one week on surgery and one week on anaesthesiology. They are included in hospital rounds where special cases are demonstrated at bedside clinics by both medical and dental staff. For several years a list of dental practitioners who maintain offices of high standard in the city has been compiled. An arrangement is made whereby the seniors spend at least one afternoon in each of two offices. Here they are shown the business side of maintaining an office, the manner in which the auxiliary services are utilized, and observe the operator at work.

During the past year the University Hospital has held weekly conferences in which a clinical case is reviewed by the clinician. To this conference is invited a basic science man in the particular field under discussion. He discusses the basic preclinical aspects of this case. It is felt this keeps the clinical man familiar with the basic science interpretation, gives the basic science man a more familiar insight into clinical application of his particular subject, and demonstrates to the student the correlation between the two. It is our hope to institute this plan into dentistry, particularly in special cases of diagnosis and pathology.

The above is a description of our facilities and courses and how we are attempting to use them to reduce to a minimum the difficulties, whether psychological or technical, that may occur during these periods of so-called transition. The interview is a useful procedure in the selection of the proper type of student. The better the student is suited to the professional type of education, the less difficulty he will experience. It is suggested that the transitional periods are less perceptible when the basic health sciences and the health professions are closely associated and co-operating on the same campus.

APPLICATION OF VERTICAL TEACHING OF BIOLOGICAL SCIENCES IN THE CLINICAL PROGRAM

GROVER C. HUNTER, JR., D.D.S., M.S.,[1] *Atlanta*

I. Introduction

At the beginning I should like to make it clear that I am using the phrase *vertical teaching* in its broadest implications rather than in the narrow mechanistic conception of a method alone as opposed to the traditional so-called horizontal method. In some instances the vertical approach simply consists of adding and shuffling the courses around in such a manner that stop-gap basic science courses are interspersed throughout the already overburdened schedule of the clinical years and made to appear vertical on paper to the non-critical appraiser. By vertical teaching of the biological sciences in the curriculum, I refer to the solid background of the knowledge and appreciation of human and biological values and processes, which should pervade the consciousness of the faculty and students alike in dealing with patients.

Sometimes our thinking and range of view may be suggestive of pronounced myopia, and the discussion of the subject in hand may indicate the feeling that we are trying to convince ourselves of a concept which should be taken as axiomatic if we are to be entitled to be called a health profession. Perhaps we should examine first what our overall goal is in attempting to train the dental student for our profession. Isn't it true that what we want to do with the student is simply this: to give him a groundwork of biological, technical, and ethical principles which he himself can apply in varying conditions and situations of practice as they arise. We wish to make of him an intelligent, efficient and ethical practitioner, who can serve his community well and by so doing increase our professional esteem and respect in the eyes of the public.

And so I shall use the phrase *vertical teaching* in biology to mean *vertical* thinking in respect to certain biological fundamentals. The unfortunate dualism between technic on the one hand and biology on the other must at last be obliterated. The mind of the intelligent practitioner is not geared to making distinctions between the two. Does the dental practitioner when confronted with a patient problem mentally separate his problem into one of technics on the one hand and of biology on the other? Is jumping over a log a mechanical or biological phenomenon? Is moving a tooth orthodontically a mechanical or biological phenomenon?

[1]Emory University School of Dentistry.

We can readily see the absurdity of trying to separate the two; what we desire after all is intelligent balance without debating the question of which is more important. Biology and mechanics should work together in bringing the patient back to health. As long as technique is considered synonymous with such adjectives as *practical, remunerative* and *self-sufficient,* and as long as biology is considered synonymous with such adjectives as *impractical, unremunerative* and *non-essential,* very little progress can be made in spite of the most elaborate plans, procedures, and programs.

II. General Considerations of Problems of Integration

The question of integration or how such a balance can be achieved naturally arises, and I should like to discuss the matter first in general without reference to a specific plan. There are certain broad general areas of application which are fundamental to all departments and specialties. Some of them are listed as follows:

1. Human behavior patterns, normal and abnormal.
2. Physical and mental hygiene.
3. Pain mechanisms and pain control.
4. Diet and nutrition.
5. Fundamentals of occlusion.
6. Experimental medicine (biol. statistics).
7. Mechanisms of disease, and disease control.
8. Growth and maturation.
9. Heredity and individual variation.
10. Basic diagnostic and treatment procedures.
11. Rational drug therapy.
12. Anatomical and functional relationships.
13. X-rays, radiation, ionization phenomena.
14. Neoplastic Disease.

To illustrate the point, let us take for instance the subject of diet and nutrition. We cannot escape a consideration of diet and nutrition, if we desire to do something of permanent value for the patient. Many departments in schools over the country are taking diet and nutrition seriously for the first time because it has been found to be sound, practical, and extremely helpful in effecting favorable tissue response to restorations.

Diet and nutrition are important in every phase or specialty of dentistry regardless of whether mechanical restorations or the treatment of diseased conditions of oral tissues are concerned. No matter how well-fitting a set of full dentures may be, unless the underlying supporting tissues are healthy and free of disease success will not be forthcoming. The role of the teeth also in this particular field is of paramount importance,

because they are vital to the overall process of digestion insofar as a well-balanced diet is concerned.

In this age of functionalism, the question of whether a thing works or not is of primary consideration. The most effective weapon of the basic sciences in this program is research and research applications. The clinical man is far more impressed with the contribution of the basic sciences if they can help him solve some of his clinical problems. Another is the encouragement of authors of textbooks to write more applied science; I do not wish to press this point beyond the elastic limit, for it would be fundamental dishonesty to try to draw clinical parallels and applications if none exist. This does not mean, however, that future developments may not alter the picture. Many biological sciences are not applied because no effort is made to apply the information already available to clinical problems. A refractory attitude about the matter will not aid basic science courses along in this clinical application.

The clinical instructors are not without a heavy responsibility in this direction also, for they probably come into more intimate and frequent contact with the student in his every day clinical practice. These men must be encouraged to orientate themselves in the basic sciences, and to attend seminars and discussion groups in which they may become better acquainted with the instructors in basic science. The contribution of their clinical knowledge in such discussions will often be stimulating and helpful to the men in basic science and research. When replacements are procured for vacancies in the clinical staff, men embued with the research and basic science approach should be strongly considered by the administration.

The vertical plan of teaching is nothing new; the Oxford tutor method and the old apprenticeship method employ the underlying idea without consciously attempting to do so. Dental schools adopted, naturally enough, the so-called horizontal method from the traditional curricula of the liberal arts and medical colleges. Undoubtedly the horizontal approach is much simpler to apply in mass education where there is an over-abundance of students, specialties, and organization, and a perpetual shortage of time, instructors and money. Since some of these factors militate against student instruction in its more ideal personal aspects, the broad general areas of biological applications and concepts can serve as a useful thread of unity to tie together the loose ends between departments and areas of instruction. A plan for group seminars of the entire clinical and basic science staffs in these areas of mutual interest may be used to effect the desired correlation between technics and basic science.

The problem is particularly acute when the student is not brought into contact with the patient until the junior and senior years. Some schools are attempting to remedy this defect by introducing the student to patient problems in actual life situations earlier in the curriculum. Many of us have had a tendency to approach the problem backwards during the freshman and sophomore years, giving the student a mass of information without the stimulation of the patient relationship and without the translation of actual application into the realistic situation of specific problems that will inevitably arise when the student has his clinical practice. The idea of basic areas of general interest and application parallels the idea of basic techniques in the mechanical phases of the curriculum. It is my feeling that the lecture courses of the junior and senior years could be reduced from the standpoint of hours, and made more efficient, more interesting, more significant, and less boring to the student by intelligent planning.

III. Specific Application to Problems of Integration

There are many plans in effect in schools over the country, and some experimentation along these lines of vertical teaching is now in progress. The medical schools have been wrestling with the problem for years and are still wrestling with it so far as I have been able to determine. I am not and hope I never shall be a blind worshipper of a plan; however, planning is and probably always will be a necessary nuisance along the pathways of progress. At any rate, I shall mention some of the things we are doing at Emory toward developing the vertical approach during the clinical years. I hasten to add, before enumerating them, that we are only beginning to effect the type of trend in this direction that we desire.

The type of program we now have in effect is as follows:

A. Coordinator of the program (basic science application) Department Dental Medicine. Full-time physician in Internal Medicine (working with Diagnosis and Dental Medicine Departments).
B. Clinical pathology laboratory in conjunction with Diagnosis Department. Laboratory course in Oral Histo-Pathology.
C. Lecture courses in Dental Medicine and Oral Physiology emphasizing basic principles and concepts.
D. Research.
E. Hospital sections, ward rounds, and patient presentations. Special lectures in Oncology.
F. Clinico-pathological conferences in which the basic science teachers are called on to discuss clinical cases.
G. Faculty seminars on topics of biological application. (Department of Orthodontia already has such a seminar.)
H. Term papers of broad biological application in Technical Composition.

This type of program linked up with our complete patient rehabilitation emphasis in the clinical years is, I hope, a step forward in the desirable direction. There are, of course, modifications to be made and shortcomings to be dealt with, but I don't think these are insurmountable. Committees could be appointed, if desired, to review the situation and recommend changes, and these committees, if appointed, should not be too large and should be composed of interested men in both technical and biological phases of instruction.

Summary

1. Vertical teaching in the basic sciences should imply vertical thinking in biological concepts and principles with specific reference to actual patient problems and the overall health point of view. Technical procedures should be consistent with this broad human and biological evaluation of the patient if our treatment planning is to be meaningful, and our treatment procedures successful.

2. The dualistic thinking concerning technics and biology must be eradicated by mutual education and cooperation. In this phase of the problem, research on basic clinical problems would be helpful. Also there is a need for a reawakening and orientation of clinical instructors as a whole to a healthy appreciation of basic science, and strong consideration should be given to the biological background and interests of new men added to the clinical staff of a school.

3. Broad general areas of common interest between the basic sciences and clinical instruction do exist at varying levels in each department. The recognition and utilization of this subject matter for mutual faculty stimulation and discussion should be encouraged.

To effect this concept of vertical teaching in the basic sciences each school will have the task of setting up a program consistent with its own needs, giving due consideration to desired objectives and methods possible within its budget, size of faculty and student body, and time limitations in the curriculum. The dental curriculum is now so full of subject matter that an addition of more of the same, in spite of the nomenclature used, would probably only complicate the existing complexities and inconsistencies without aiding us in accomplishing our primary objectives so far as dental student education is concerned.

THE PLACE OF BACTERIOLOGY IN THE DENTAL CURRICULUM AS AN EXAMPLE OF VERTICAL TEACHING

HERBERT M. COBE, Ph.D.,[1] *Philadelphia*

During the past decade and since the completion of the dental curriculum, there has been considerable floundering regarding the position of various subjects in the dental program and the time at which these should be taught. There has been much discussion about integration of the so-called basic and clinical sciences; vertical as against horizontal teaching. From a survey of the present curriculum, it is apparent that the position of bacteriology in most of the programs is that of inclusion in the field of basic science.

By definition, a basic science is one that is fundamental and which is or should be undertaken as a precursor to: more advanced study, research or clinical application. This has come to mean in dental education, that basic science and preclinical science are synonymous. According to Nuckolls,[2] observations in general indicate that in medicine and dentistry integration of basic and clinical patterns are the chief concern. In dental bacteriology there is undoubtedly more pure research of a practical and academic nature than in any other branch of dentistry. The tremendous work in periodontology, caries control and oral surgery is an example of this.

The apparent need for closer integration of the clinical and basic sciences in dentistry has been emphasized by Schour.[3] In our own experience it has been found that while there is considerable overlapping in various departments of the basic sciences there is actually little duplication of bacteriological instruction in the preclinical group. Duplication when it occurs is found in the clinical years and this has been overcome by the vertical approach of staff and clinic conferences with departmental heads. The explanation for this is shown in Table I which shows the ramifications that extend from its position as a basic science to the clinical sciences of the succeeding years. This is the desired vertical approach.

Every instructor in a preclinical science has the experience that students tend to regard a basic science as an independent unit. This is a carry-over from the horizontal method of teaching. They may regard the subject as a whole in itself but not part of the greater pattern. If students

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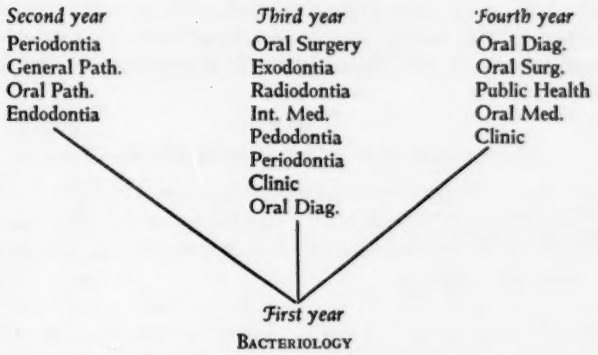
[1]Department of Bacteriology, Temple University Dental School.

[2]Nuckolls, James: J. *Dent. Educ.*, vol. XI, No. 2, Dec. 1949; 61-65.

[3]Schour, Isaac: J. *Dent. Res.*, vol. XX; June, 1941; 221-230.

TABLE I



early were shown a complete picture of the entire curriculum: basic and clinical science and their relationship to the entire practice of general and specialized dentistry, a logical relationship would evolve. This is correlation! The situation is similar to that well known psychological devise of running rats through a maze. Rats that have been elevated so that the entire panorama was visible before the trial run was made showed faster and better achievement than rats who had a limited perspective. So it is with dental students in their application to bacteriology and the perception of its ramifications.

In our own and other schools, specific complaints have been made that even after an intensive course in bacteriology, students are not able to correlate the techniques learned with their clinical application. This part of the educational process is definitely associated with the "transfer" of learning and is extremely difficult to evaluate or classify on the basis of scholastic achievement or an innate intelligence quotient.

We do not have any specific complaints with the present trend in dental education. The trend is along normal evolutionary lines of which vertical teaching is an example. In our university the faculty voluntarily takes courses in the school of education to correlate all branches of dental teaching.

When a three-year course in dentistry was the vogue bacteriology had four hours of didactic work in the second year as suggested by Horner.[4] This has evolved so that the report of the survey committee[5] recommended a standard course in bacteriology to be included in the first year.

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[4]Horner, H. H.: Univ. Chicago Press, 1946; 227 ff.
[5]Am. Assoc. Dent. Schools, Curriculum Survey Comm., 1935.

The variations which occur in a standard course, so-called, are considerable both as to the number of clock and semester hours and in the position of this course in the dental curriculum. A survey of the 40 dental schools in the United States is summarized in the following tables:

TABLE II

Range of Clock Hours of Bacteriology in 40 Dental Schools

	Lowest	Highest
Lecture Hours	16	48
Laboratory Hours	44	144
Total Hours (Range)	66	230

TABLE III

Curriculum Place of Bacteriology in 40 Dental Schools

1st year	2nd Year	1 & 2 Yr.	1, 2 & 3 Yrs.	2 & 3 Yr.
13	25	0	1	1
32½%	62½%		2½%	2½%

It is always easy to criticize any existing system and unless a suitable constructive program can be offered criticism is useless. Every teacher has some ideal program at least tentatively outlined and the 14 points brought out by Dr. Hunter are essentials in this type of educational process. We have outlined a short program which favors this vertical approach and which stresses one main point: basic science courses must point up the way toward an apex of fundamental information and the clinical sciences must reach down and pull up for their own use, this information.

We do not have this plan in effect at Temple, it is merely the vague stirrings of a plan which has much to offer and which we are aiming toward:

First: A short elementary course should be given in the first year to comprise the essential broad procedures:

a. morphological classification
b. bacterial motility
c. general staining techniques
d. preparation of suitable smears, films and cultures
e. bacterial isolation
f. aseptic techniques.

This is in general an involvement of techniques.

Second: An advanced course in Bacteriology in the Junior or Senior year to include the following:

a. diagnostic staining techniques
b. detailed study of individual pathogenic microorganisms
c. chemotherapy as applied to
   1. endodontia
   2. periodontia
   3. oral surgery and exodontia

Third: Bacteriological research involving special dental, dental-medical public health and clinical problems. These should be carried out under the direction of the teaching staff and supplemented by symposia and conferences.

There are many variations that occur in the time sequence of a standard course in dental bacteriology. This is primarily due to the organization and pattern of the entire course curriculum of the specific school. For example, in a good many schools, which are on either a semester or trimester basis, the so-called "block system" is possible, whereas in other schools the lecture and laboratory periods come at so many stated times a week.

Much is to be said on behalf of both systems, but where the block system has been worked out to run concurrently with another course so that for a period of eight weeks alternate half-day sessions are held in each of these courses, many features are capable of development that are impossible with the broader spaced laboratories. Certain biological tests are feasible, certain characteristics of species of a progressive nature are evidence and demonstrable; many of these are lost in a weekly or semi-weekly system. Biological processes cannot always be held back to make them available for student study. Certainly some of the fleeting and temporary reactions in bacteriological testing are lost unless followed over a considerable period of time. How important these have to be in a general elementary course is a subject for some controversy.

Just as there is a variance in the timing and scheduling of this subject in the curriculum, so is there variation and non-agreement as to what constitutes essential material to be taught. Whether members of the Colon-Typhoid-Dysentery Group should be included in a general course of mouth or oral bacteriology is a matter of opinion. Certainly these members of the group can be used as demonstrative of certain biological procedures and tests that may be seen in completely unrelated groups of organisms. The production of methyl acetyl carbinol, or the reduction of nitrates to nitrites can be demonstrated with this group as well if not better than with any other members of similar groups.

A survey of manuals used in various laboratories shows a considerable variability in subject and course content. The sequence of presentation is completely different in many schools. This condition may be forced on departmental heads by the lack of available clock hours. A composite survey of textbooks and laboratory guides shows that there are as many or more texts offered as there are courses given throughout the country.

That there is a definite need for correlation among the various schools throughout the country is evident, the willingness to study methods of correlation from an educational and scientific viewpoint is not so apparent. Some strides have been made but the need for conference, planning and mutual agreement among the dental bacteriologists and the dental schools still exists.

Procession

The ages pass and we who, day by day,
grow old

See those who come to take our place,
with spirits bold,

Absorb the moldy knowledge of the sage

Then add their own fresh thought to this
new age.

We smile, for they who come display

A courage boding good for their new day.

—Jack Southworth.

AUDIO-VISUAL AIDS AS TEACHING DEVICES

ALICE A. FORD, D.H., B.S.,[1] *Washington, D. C.*

The use of audio-visual aids in formalized education dates back for centuries. Sand, boards, and slate were the predecessors of the modern blackboard, and likewise specimens and real objects were used to illustrate and inform.[2] Today marked emphasis is being placed on visual aids for teaching. Many teachers have become enthusiasts to the extent that they have failed to regard such aids as "audio-visual aids to instruction." Instead the aids have become entertainment or substitutive devices.

In the average community dental caries is the greatest cause of loss of teeth during the early part of life. It is the responsibility of the dental profession to discover these defects early, correct them with the least amount of discomfort to the child, and at a minimum cost. This cannot be accomplished overnight, and even if it could be, the child is not being provided with the necessary knowledge for him to assume his individual responsibility of maintaining good health.

The child who is just entering school has had very little experience with things, people, ideas and relationships. As a learner he is suddenly confronted with the big task of mastering a large number of facts, concepts and relationship. He must further organize his experiences so that they are meaningful and functional. Here is an opportunity where the use of audio-visual aids by the dental hygienist can give substantial support to dental health education.

How then can audio-visual aids function in teaching dental health?

Audio-Visual Aids Can Give Correct Initial Concepts.[3]—The learner must have a true mental impression. The dental hygienist cannot be certain that her verbal description of a good toothbrush will impart the correct impression. Models, pictures or blackboard diagrams will achieve conveyance of a correct initial concept.

Audio-Visual Aids Can Intensify Impressions.—A poster of good size and vivid in color will have a strong appeal, causing the imagery to become firmly embedded in the mind.

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[1]Instructor, Oral Hygiene Division, Oral Medicine Department, Howard University College of Dentistry.

[2]McKown and Roberts: Audio Visual Aids to Instruction, 1st edition, p. 4; New York; McGraw Hill Co., 1940.

[3]Umstattd, J. G.: Secondary School Teaching, 1st edition, p. 288; New York; Ginn Co., 1937.

Audio-Visual Aids Can Satisfy the Immediate Curiosity They Cause.[4]—A child's curiosity about a model, poster or his own extracted deciduous tooth may be only temporary, but the dental hygienist can recognize this as a starting point, and logically fill in this gap.

Audio-Visual Aids Can Give Experiences With Concrete Things.[5]—Real objects or specimens that the child can see, touch and handle will give definite meaning to many words and thereby combat the child's use of words without attention to thought.

Audio-Visual Aids Can Motivate.—The dental hygienist needs to establish one of the first laws of learning—that is, "mind-set." By creating curiosity in the form of interest she is guaranteed attention. Once the child shows interest in a model, the way is paved for further activity, mainly thinking activity.

Audio-Visual Aids Can Clarify.—Visual aids are supplementary devices that reinforce verbalism. A film on dental health can be used effectively by the dental hygienist in one of three ways: First, as a preview—the approach to the lesson; second, to present new material, and third, as a summary to strengthen any foregoing verbal discussion.[6]

Audio-Visual Aids Can Stimulate.—Most visual aids used to teach dental health are interesting, and some even provide the child with an opportunity to manipulate them. The child's natural curiosity gives the dental hygienist the convenient occasion to answer any questions which the child might otherwise hesitate to ask. It is understood that he probably feels freer, because this type of setting is more like an out of school situation.

Audio-Visual Aids Can Save Time.—Whether she be employed in a classroom, private office, or hospital the dental hygienist, like any other teacher, is confronted with the question of keeping pace with our rapidly moving society. There is so much to be learned in so little time. We want this learning to be motivated in such a manner that permanent impressions will result creating more wholesome attitudes and habits toward dental health.

In conclusion, it is believed that the increased use of audio-visual

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[4]McKown and Roberts: Audio Visual Aids to Instruction, 1st edition, p. 25; New York; McGraw Hill Co., 1940.

[5]Umstattd, J. G.: Secondary School Teaching, 1st edition, p. 290; New York; Gill Co., 1937.

[6]Conrad and Meister: Teaching Procedures in Health Education, 1st edition, p. 103; Philadelphia; W. B. Saunders Co., 1939.

aids by the dental hygientist will make her work more exciting and more effective. She should study the various materials separately in order to learn the specific contribution of each. When this has been accomplished it should be easy to understand the best way to integrate them for effective permanent learning.

COLLEGE NEWS

Edited by SIDNEY EPSTEIN, D.D.S., *San Francisco*

Creighton University:

Faculty Appointments

The following have been appointed to the Faculty: James E. Cosgrove, D.D.S.; Anthony M. Circo, D.D.S.; Fred G. Nasr, D.D.S.; H. S. Susman, D.D.S.; J. M. Williams, D.D.S.

Dr. B. L. Lynch has been appointed Director of the Cancer Training Program.

Emery University:

A graduate of this school, 1927, Marvin Harper has served these 24 years as a Missionary in India

Medical College of Virginia:

Announcements

The ground was broken for a new dental building September 11, 1951.

The U.S.P.H.S. has renewed a gift to the school for the study of prenatal influences on the development of the teeth and supporting structures.

New York University:

Announcements

The periodontia department announces several courses for the year 1952-53.

Ohio State University:

Announcement

Nine postgraduate courses in Dentistry will be held between September and December, 1951.

Temple University:

Promotions

Joseph Ewing, professor, crown and bridge prosthesis.

M. L. Leitah, D.D.S., professor, histology.

Morton Amsterdam, associate professor, orthodontics.

R. B. Hedges, associate professor, orthodontics.

Metro Kotanchik, assistant professor, crown and bridge prosthesis.

Faculty Appointments

The following have been appointed instructors:

E. S. Czarnecki, D.D.S., pedodontia.

C. A. Nagle, D.D.S., operative dentistry.

Edward Walchinus, D.D.S., radiodontia.

H. N. Smith, D.D.S., prosthetic dentistry.

Jack Deitch, D.D.S., instructor, oral anatomy.

Jack Hamilton, D.D.S., instructor, oral surgery.

A. E. Livingstone, instructor, pharmacology.

Stanley Dietz, D.D.S., instructor, periodontics.

Samuel Paul, D.D.S., instructor, endodontics.

John D'Allosandro, D.D.S., instructor, oral diagnosis.

Edward Reichert, D.D.S., instructor, oral diagnosis.

Leonard Giordano, D.D.S., instructor, crown and bridge prosthesis.

Theodore Kaczmar, D.D.S., instructor, crown and bridge prosthesis.

W. H. Saylor, D.D.S., instructor, crown and bridge prosthesis.

Tufts College:

Announcement

Announcement is made of the Third Barkshire Conference in Periodontology and Oral Pathology to be held in Lenox, Mass., June 15-19, 1952.

University of Illinois:

Faculty Appointments

G. W. Dittmar, Jr., D.D.S., assistant professor, full, partial and removal denture department, promoted from instructor.

Awards

The university presents an interesting situation in the matter of the relationship between teacher and taught. Each class votes upon that instructor who may have, in their estimation, shown helpfulness, excellence and interest to the greatest degree. There is presented to each what is known as the Nell Snow Talbot instructorship award. That award was won this year by Drs. T. B. Kurtz, A. A. Zimmerman and W. H. Kubacki. Two classes selected Dr. Zimmerman, two classes selected Dr. Kurtz. Dr. Kubacki received the "All-School Award."

Announcements

A two-year full-time postgraduate course in basic science with limited clinical experience is offered through the department of oral and maxillofacial surgery.

University of Pennsylvania:

Resignation

John W. Ross, D.D.S., as Chauncer M. F. Egil professor of orthodontics and chairman for dentistry.

Faculty Appointments

Thomas R. Alley, D.D.S., oral medicine.

Robert Burkhardt, D.D.S., inlays.

David Cohen, D.D.S., oral medicine.

S. Cohen, D.D.S., pathology.

Robert Keller, D.D.S., bacteriology.

H. G. Kimball, D.D.S., roentgenology.

Alvare Henriques, D.D.S., operative dentistry.

V. R. Parks, D.D.S., operative dentistry.

L. J. Pinsker, D.D.S., crown and bridge prosthesis.

M. T. Romano, D.D.S., operative dentistry.

Frank Rubei, D.D.S., operative dentistry.

J. Sayegh, D.D.S., oral diagnosis.

D. C. Sallada, Jr., D.D.S., operative dentistry.

F. M. Sophocles, D.D.S., operative dentistry.

R. E. Walsh, D.D.S., operative dentistry.

M. B. Weiner, D.D.S., operative dentistry.

Announcements

Dr. I. S. Radvin, acting vice-president in charge of medical affairs, including the school of dentistry.

Dr. Carl Zeisse, acting director, department of orthodontics.

Dean Appleton resigned at the end of last college year and Dr. Lester W. Burket has been appointed to fill that position.

Arthur B. Gable, D.D.S., professor, operative dentistry, will fill the position of visiting professor for this college year at the University of Sao Paulo, Brazil.

An extensive program of postgraduate courses for the years 1951 and 1952 is announced by Dr. Burket.

University of Tennessee:

Faculty Appointments

F. N. Weber, D.D.S., promoted from associated to full professorship in the department of orthodontics.

Miss Sarah E. Hill, director of dental hygiene for the dental hygienists.

BOOK REVIEWS IN REVIEW

Conducted by DONALD W. WASHBURN, D.D.S.,[1] *Chicago*

Periodontia, Clinical Pathology and Treatment of the Periodontal Tissues, by Edgar D. Coolidge, B.S., M.S., D.D.S., L.L.D. (Hon.) Professor Emeritus of Therapeutics, Preventive Dentistry and Oral Hygiene, Chicago College of Dental Surgery, School of Dentistry, Loyola University, Chicago, and Maynard K. Hine, M.S., D.D.S., Professor of Periodontia and Histopathology and Dean, Indiana University School of Dentistry. First edition. Philadelphia, Lea & Febiger, 1951; 318 pages, 378 illustrations, two in color; $6.00.

"This volume is a companion volume to Doctor Coolidge's book, 'Endodontia,' in which Doctor Hine helped revise the chapter on Gingivitis Caused by Infection. . . .

"Both of these men are well known to dentistry as educators, researchers, and contributors to dental literature. Their interests in periodontia and the necessity of creating an awareness in the minds of the general practitioner of the insidiousness of the conditions leading to this all too common affliction in man has led them to title the book, 'Clinical Pathology and Treatment of the Periodontal Tissues.'

"The book has thirteen chapters and, as listed above, only 318 pages. Taking into consideration the scope of the work covered, the authors have made a fine contribution in keeping out superfluous verbiage, making the book readable and not too long. Illustrations are excellent and well labeled. One fault is having to go back or forward in the book to check on an illustration reference. This does not occur too often and is not the authors' fault. A few errors in proofreading are present, one in which an 'm' is left out of 'for,' changing the gist of the sentence and leaving one in a quandary for a moment."—Jean P. Cantou. *Journal of the California State Dental Association,* 27, 91-93; March-April, 1951.

"The object of this book, as indicated in the preface, is to provide a text that will be helpful in the study of the problems involved in the treatment of periodontal diseases. This formidable task has been accomplished with noteworthy success. This is a scholarly treatise, well documented and illustrated. It contains 13 chapters. The chapter titles are arranged according to broad subject classifications, but a detailed subject index makes it possible for one to easily locate specific items. Each chapter is accompanied by a carefully selected bibliography. A complete bibliographic index is also included.

"The book can be highly recommended as a textbook for students and as a reference volume for those interested in the principles and practice of periodontia."—E. Alan Lieban. *Journal of the American Dental Association,* 43, 244; August, 1951.

"The periodontist more than any other specialist is the guardian of the patient's oral health and all dentists should be thoroughly familiar with this subject. The purpose of this book is to provide a text that will be helpful in the study of the problems involved in the treatment of periodontal disease. The material used has been accumulated during many years of practice, research and teaching by the authors and is well worth the careful perusal of all dentists."—M.H.G. *Journal of the Canadian Dental Association,* 17, 161; March, 1951.

"Diagnosis and Treatment! In writing this book the authors have provided a text that will be most helpful in the study of the problems involved in the treatment of periodontal diseases. It is based upon their

[1]Librarian, American Dental Association, Chicago.

experiences gained in practice, in classroom teaching, and by extensive research activities in this specialty.

"The result is a sound guide to the proper recognition of symptoms, correct diagnosis and effective treatment of periodontal diseases."—*Bulletin of the National Dental Association, 9,* 202; April, 1951.

"This text will be exceedingly helpful in the study of the problems involved in the treatment of periodontal disease. With the opportunities for service increasing, the incidence in the younger, as well as in the older, patient will be noted. The control of periodontal disease and the prolongation of the natural dentition, at all ages, is well discussed in this book. One could consider this work as a private postgraduate course in periodontics.

"This text, logically planned and appropriately illustrated, will be most helpful in the study and practice of the problems involved in the treatment of periodontal disease. The general practitioner cannot help but be improved by a reading of this Coolidge-Hine work."—*Pennsylvania Dental Journal, 18,* 86; March, 1951.

"The plan of the text is to begin with the normal condition of the soft tissues in good health and consider the gradual tissue changes that develop under local irritation and infection. The pathological conditions that appear in association with certain systemic disorders, as well as the degeneration of the periodontal tissues are taken up in sequence. Trauma and traumatic injuries and atrophic tissue changes are considered in detail. Finally, the home care of the teeth and soft tissues is emphasized and illustrated in the treatment of periodontal disturbances.

"Although references have been made to the written statements and results of research of many other authors, and they have been quoted to some length on related subjects, Dr. Coolidge and Dr. Hine have based their text for the most part upon their experiences gained in practice, in classroom teaching, and by extensive research activity in their specialty.

"This book is highly recommended as a sound guide to the correct diagnosis and treatment of the periodontal tissues.—Edgar S. Bacon. *Annals of Dentistry, 10,* 111-112; September, 1951.

"This text will serve as a useful introduction to the subject of periodontia for the dental student."—P.H.B. *Dental Items of Interest, 73,* 442-443; April, 1951.

"It is unfortunate that in dividing his former book (*Clinical Pathology and Treatment of the Dental Pulp and Periodontal Tissues*) into two volumes Professor Coolidge has not taken greater care in revising the subject matter of the volume on periodontia. Thus we find consideration of caries prevention, whilst the operations of scaling the teeth and surgical gingivectomy are each dismissed in a page.

"The value of this work would appear to be for those who are already familiar with the subject, for, although there is much which is good, the extreme lack of operative detail makes it unsuitable for the undergraduate."—*Dental Practitioner, 1,* 390; August, 1951.

Textbook of Periodontia (Oral Medicine), by Samuel Charles Miller, D.D.S., F.A.C.D., F.A.D.M., Professor of Periodontia and Chairman of the Periodontia Department, New York University College of Dentistry; with the cooperation of the members of the periodontia staff of the New York University College of Dentistry and an introduction by John Oppie McCall. Third edition. Philadelphia, Blakiston Company, 1950; 900 pages, 586 illustrations; $11.50.

"The third edition of this textbook shows a marked increase in size. Not only does it contain 167 more pages than the second edition, but a smaller type is used which permits four pages of the older edition to be compressed into three pages of the new.

"This increase in size is the more re-

grettable as the reviewer felt that the second edition could have been improved by some judicious pruning. Such chapters as 'Physiologic Basis of Periodontal Treatment' summarizing general physiology, and 'Laboratory Aids to Periodontal Diagnosis' giving details of techniques of clinical pathology, must be of little value to the student who is required in the course of his training to study these subjects separately from the appropriate textbooks. The forty pages of glossary would also seem to be an unnecessary feature. The cost of this volume now places it out of the reach of the average student in this country.

"Various techniques and theories lack critical evaluation. For example, one reads on page 351 that the effects of occlusal disharmony may be 'insufficient wear,' or 'excessive wear,' and no attempt is made to explain which is the more likely to be found, or why they should occur. The tendency is to include as many theories and techniques as possible, give each equal weight, and leave it to the reader to decide which to adopt. The large number of contributors to the text may be partly responsible for a reluctance to condemn anything.

"Despite these faults this volume should prove of great value as a book of reference. A valuable feature in this respect is the large 'Bibliography and Suggested Reading' at the end of each chapter."—*British Dental Journal, 91,* 25; July 3, 1951.

"The standard of printing is extremely high and all subject matter is adequately illustrated. There is no doubt that the subject of periodontia is very fully considered in this book, and no teacher of the subject can afford to be without it, whilst all those who wish to practise full-mouth dentistry should read it.

"There is an extremely extensive glossary as well as an index of proper names and a subject index. These three items occupy 154 pages, of which 48 are given to the glossary containing many words which are not peculiar to periodontia. Deletion of this part would in no way detract from the value of the book, and would permit a redutcion of price."—*Dental Practitioner, 1,* 287; May, 1951.

"In his third edition, Doctor Miller discusses every phase of periodontal disease. The text begins with the description of cell physiology, histology, and pathology of the various tissues concerned in periodontal treatment.

"Causative factors of periodontal disease are presented and discussed; numerous illustrations are shown; and local etiological factors are enumerated and elaborated upon. To a certain extent the relationship of systemic conditions to periodontal lesions is correlated; however, it is accepted that some phases of periodontal disease will remain an enigma until well-controlled investigations will solve the relationship between systemic disturbance and their possible oral manifestations.

"A considerable portion of the text is devoted to the description of laboratory aids to diagnosis, i.e., blood tests, urinalysis, basal metabolism, skin tests, etc. Dr. Miller stresses the importance of the dentist being aware of any deviations from the normal through his knowledge of these tests."—Joseph S. Restarski, D.D.S., M.D.S. *Illinois Dental Journal, 20,* 9; January, 1951.

"In general, the author strives to cover every phase of peridiontal disease and treatment. The bibliography is extensive and carefully selected. This book would be a good addition to the dentist's library."—Joseph S. Restarski. *Journal of the American Dental Association, 43,* 386-387; September, 1951.

"The two new chapters which have been added, namely: 'Psychosomatic Relations in the Etiology of Periodontal Disease' and 'Periodontal Disease in Children' are necessary adjuncts to the field of periodontia, particularly the latter chapter which has

received favorable comment. Since there has been a scarcity of literature on the subject of periodontal disease in relationship to pedodontics up to this point, this particular chapter will be well worth reading by every person interested in this field of dentistry.

"Other noticeable features of the book are improvements in the illustrations and cuts, a re-arrangement of outlines permitting successful presentation of material and the use of additional diagrams and photographs for illustrations.

"It is to be hoped that the final chapter of this book 'Presenting Periodontia to the Patient' will serve to make the dentist aware of his responsibilities in the education of the patient as to the importance of maintaining the gingivae as well as the teeth in a healthy and hygienic condition." —George M. Stewart. *Pennsylvania Dental Journal, 17,* 306; December, 1950.

"The most remarkable gain in this new edition is the chapter on periodontal diseases in children. Never before in any textbook has this subject been given the importance it deserves. The wide scope of this field and the significance of early diagnosis and treatment is well brought out. A statement that penicillin is the drug of choice in the treatment of herpetic stomatitis is questionable, however.

"The material presented proves that periodontal diseases usually can be treated successfully even in rather advanced stages. No panacea is available to provide a 'short cut' in this treatment. It is generally recognized to be the responsibility of the dentist to acquire sufficient knowledge and manual skill to give his patients the best available health service which, of course, includes periodontia. To present periodontia in such a way that the old fatalistic attitude towards this problem can be overcome is, unfortunately, a less commonly recognized responsibility. Furthermore, there is today a growing and highly justified feeling that the dentist has a responsibility for the oral and general health of the patient beyond the teeth and their supporting structures. This book can be highly recommended both as a source of knowledge and for its stimulating way of presenting periodontia and oral medicine as a challenge to the dental profession."—Sigurd Ranifjord. *Journal of Oral Surgery, 9,* 170-171; April, 1951.

"The book is printed for the general practitioner of dentistry rather than the specialist. It is fundamentally sound from the standpoint of etiology, diagnosis, prognosis and treatment of periodontal lesions. The author has cited many outstanding men in the field of periodontology.

"The book is lacking a section devoted to mouth rehabilitation following the elimination of periodontal pathology. The success or failure of many treated cases is dependent upon method of occlusal reconstruction. There is, however, a chapter on splinting of loose teeth that demonstrates various methods both fixed and removable.

"The book is very well written and easily readable. Each chapter contains numerous photographs that represent or point out the important points of that particular discussion."—Mark Gilson. *Journal of the Michigan State Dental Association, 33,* 214; November, 1951.

"The chapter on periodontal disease in children is written by a Sylvia E. Zappler. It would seem that there must be more to that disease than we realize, especially in those areas where diets are poor or insufficient. Most internists believe that soft tissue and bone troubles in children are due to poor nutrition or to some definite systemic disturbance. The great ability of young tissues to heal and repair themselves could have been stressed. Most of us usually think of periodontia as dealing with a degenerative disease of declining years."—Randall L. Wescott. *Fortnightly Review of the Chicago Dental Society, 21,* 14; April 15, 1951.

"The outstanding novelties, not included in the previous editions, are a chapter on Periodontal Disease in Children, and another on Psychosomatic Factors in the Etiology of Periodontal Disease.

"However, despite the effort at detailed description of the various diagnostic laboratory tests, most of which are not apt to be made in the dental office, it is somewhat surprising, on the other hand, to note a degree of apparent lack of clinical differentiation of some of the more common gingival lesions; as in the different types of gingival recessions, the clefts, and the festoons. Their etiology is so widely divergent and therefore, necessarily, their treatment.

"A very commendable feature in the book is the uninhibited presentation of the various methods of therapeutic procedure, each described and illustrated in detail, by its respective recognized authority. This is valuable in that there are specific instances where practically any one of these methods may be utilized advantageously, even by one habitually accustomed to a single technic.

"Generally speaking, Miller's book is well planned and produced, and should constitute an important asset to the libraries of both the general practitioner and the specialist."—Isador Hirschfeld. *Annals of Dentistry*, 10, 112-113; September, 1951.

"In the two previous editions of this volume, Dr. Miller and his associates succeeded in producing a textbook which adequately and concisely described almost every phase of periodontal theory, practice and technic. In this third edition, all latest developments have been evaluated and incorporated and the previous material has been reviewed. Older methods have been dropped in favor of better ones but the successful methods of the past have all been retained.

"This volume is larger than the previous books. What has always been a valuable feature of this textbook, *viz.* a voluminous and accurate index, has been retained and the reader has no difficulty in finding the information he wants urgently. To this reviewer, who used the textbook in dental school, it is still invaluable as an everyday tool for diagnosis, as well as an easy reference for such matters as laboratory aids to periodontal diagnosis (chapter 6), systemic effects of periodontal disease (chapter 23), and presenting periodontia to the patient."—Norman M. Ordene, D.D.S. *New York State Dental Journal*, 17, 283; June-July, 1951.

"The text being coherent, thorough, and well-conceived, naturally is compactly organized. But it is just not a new edition of an old text. It is a fresh approach to an old problem. The biology and physiology of dentistry and dental practice are herein unfolded in all their basic significance and application. Five new chapters have been added. They deal with 'Psychosomatic Relations in the Etiology of Periodontal Disease,' 'Choice of Treatment for Periodontal Pockets,' 'Restoration of Centric Occlusion and Repositioning of the Mandible by Equalibration of Occlusion,' 'Internal Medicine and Periodontal Disease, and 'Periodontal Disease in Children.' The excellent bibliography for suggested reading serves as a wide source of reference for those who may wish to delve deeper into particular areas of periodontal knowledge and practice."—Joseph J. Obst. *New York Journal of Dentistry*, 21, 174; April, 1951.

"In the thirty-two years that the present reviewer has been in practice, dentistry as a health service has made tremendous strides. These strides are now obvious to some degree in the majority of dental texts. However, Samuel Charles Miller in *Textbook of Periodontia* has succeeded in rationalizing the treatment of periodontal disease to such a degree that the work compares favorably with the most advanced medical texts. Generally speaking, the causes of periodontal disease may be

diverse and confusing; however, this disease is amenable to rationalized treatment.

"*A Textbook of Periodontia* will do much to elevate dentistry to its logical plane as a branch of health service. The authors and the publishers are to be congratulated for this splendid contribution to contemporary literature. This book cannot be too highly recommended to dental practioners both young and old. In fact, no dental practitioner who is worth his salt can afford to be without this magnificent text."—P.HB. *Dental Items of Interest*, 72, 1330; December, 1950.

BOOK ANNOUNCEMENTS

Chaucer's World, compiled by Edith Rickert; edited by Clair C. Olson and Martin M. Crow; illustrated by Margaret Rickert. This is a book of 456 pages, including a lengthy bibliography and an index. This is a "collection of material" growing out of a research project conducted by the late Professors John M. Manly and Edith Rickert, resulting in the publication of *The Text of the Canterbury Tales* in 1940. It is a splendid arrangement of notes and quotations and conversations and statements of that period, so as to make it an inimitable history of that period some six hundred years ago. The illustrations are magnificent. It is so arranged and printed both as to type, paper and binding, as to make it a desirable book for any library.

There is a point of interest to professional men in that there is quoted in full a Code of Ethics for physicians, which also fits the dental profession. It is printed in full in this issue of the JOURNAL.

The book is published by Columbia University Press, 1948. Price $6.75.

Dental Bacteriology (Library Guide). This guide, of 77 pages of laboratory experiments and questions, is set up in spiral back, flexible cover form, and is written by L. W. Hedgecock, Ph.D., St. Louis University School of Medicine, and P. J. Ferrillo, D.D.S., St. Louis University School of Dentistry, designedly for dental students. Published by Burgess Publishing Company, Minneapolis 15, Minn. (1950). Price $2.00.

Inlays et Onlays. This is the title of a book on this particular subject, by Docteur Le Huche, professeur adjoint á l'Institut de Stomatologie de la Faculté de Médecine de Paris. It is a book of 242 pages, with an index, and a bibliography. It is written wholly in French and has 177 illustrations. Published by Julian Prélat, 6, Rue de la Bücherie, Paris (V^{e}). Price, Broche, 1.660 fr. Cartonne, 1.960 fr.

General Information

Address all correspondence relating to manuscripts and copy for publication in this JOURNAL to the editor, John E. Gurley, University of California, College of Dentistry, The Medical Center, San Francisco 22, California.

Address correspondence concerning sale of the JOURNAL and advertising space to the business manager, Charles W. Craig, University of California, The Medical Center, San Francisco 22, California.

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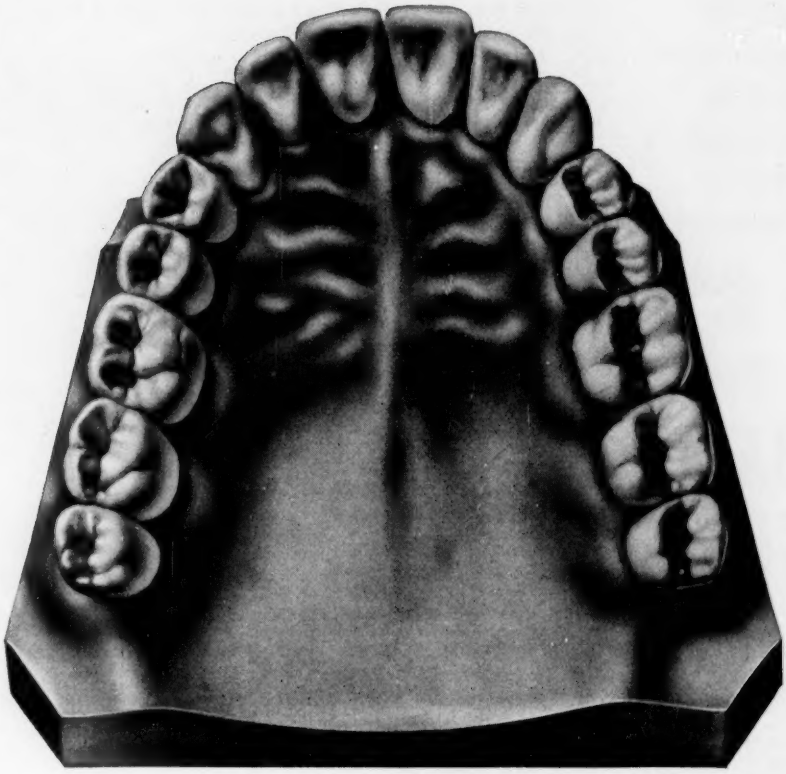

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